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New Jib Crane.

We present herewith an illustration of a Jib Crane, made by The Yale Lock Manufacturing Company, of Stamford, Connecticut, which embodies many novel features all of which tend to convenience and simplicity in construction and operation. The frame is made of wrought iron channel beams, and turns upon suitable bearings at top and bottom, the bearings being bushed with bronze, and the pins or pivots being of steel, so that the friction of rotation is reduced to a minimum, and the swinging of the crane can readily be effected by simply pulling or pushing the load.

In the crab at the bottom of the mast is contained all the mechanism for hoisting, lowering and traversing the trolley on the jib. The chain is endless, and in the usual course of operation of the machine will be equally subjected to wear throughout its entire length, so that the durability of the chain will be greatly increased. This will be appreciated by those who have used the old type of cranes, where the same part of the chain is always used in hoisting and lowering and wears out much before the rest of the chain. In this crane the same part of the chain is almost never used twice in succession in hoisting and lowering. Hoisting is accomplished by turning in the proper direction either one of the cranks shown at the foot of mast.

These cranks each operate an independent wheel, each of which engages with a separate part of the chain, and, as each is differently geared, a slow or fast speed is obtained by using either one or the other crank. If both are turned simultaneously in the same direction, the speed of hoisting or lowering will be doubled. By placing the crank upon the center shaft a still more rapid motion is obtained for lowering or for raising the empty block.

The arrangement for traversing the trolley on the jib is very simple and is certainly a great improvement over the separate gearing which is ordinarily in use for accomplishing this object. The operation is as follows: by slipping both pinions into engagement with the large center wheel, which can readily be done whether the crane is loaded or not, and turning any of the shafts one part of the chain will be "paid out" and the other "taken in" at equal speed. The result of this will be that the load will remain suspended and the trolley will be pulled either in or out upon the jib, accordingly as the shaft is turned in one direction or the other. Under all circumstances the load is self-sustained and cannot run down. These cranes are adapted for any uses to which jib cranes have heretofore been put in foundries, machine shops, etc. The compactness of the crab and trolley mechanism is advantageous in shops where it is desired to place the mast close to the wall or to get as much hoist as possible.

NEW JIB CRANE IN A ROLLING MILL.

Halpin's Compound Engine.

We continue from last week the description of Halpin's Compound Engine, and the particulars of a test, as taken from the columns of our contemporary, *Engineering*. The engravings will be found on our second page.

The details of the cross head are shown by Figs. 10, 11 and 12, from which it will be seen that the blocks are adjustable for wear, while provision is made for oiling the cross head pin bearing through the upper block, as shown in Fig. 11. Figs. 13, 14, 15 and 16, show details of the connecting rod, which, like the cross head, is of exceedingly neat design. The arrangement adopted for lubricating the crank-pin bearing while the engine is in motion is shown by Figs. 17, 18 and 19. It will be seen that an oil cup is provided concentric with the crank shaft, a radial tube connecting the oil cup with the crank pin; while a hole bored in the crank pin conducts to the bearing the oil supplied by the radial oil tube. The crank pin has a loose collar, which is secured in place by the oil tube, this latter being in its turn secured by a set screw as shown. The wearing surfaces provided in all parts of the engine are ample, and during the trials, of which we shall shortly speak, there was not the slightest sign of anything approaching a warm bearing. We should add that the details of the design generally have been worked out by Mr. W. Schonheyder, to whom great credit is due.

The fly wheel shown on the engine in Fig. 1 is, we should state, not the fly wheel which it is ordinarily proposed to supply with such an engine, but is a special wheel provided to act as a brake wheel during the experiments. The details of this wheel with its brake are shown by Figs. 20, 21 and 22, page 2, and from the section it will be seen that the rim of the wheel is of trough form, thus giving the very heavy appearance to the rim in the side elevation. During the experiments the wheel was fitted with a friction brake of the Royal Agricultural Society's pattern provided with the Amos compensating levers, as shown, the effect of these levers being to tighten the strap if the suspended weight falls, or to slacken the strap if the weight lifts. To aid in keeping the wheel cool, a constant stream of water was run into the trough-shaped rim, where it was carried round by centrifugal force, while to enable the circulation to be maintained without the surplus water splashing about, another pipe was provided, having its end curved so as to meet the rotating stream of water on the wheel, this curved pipe thus acting like the Ramsbottom scoop for supplying water to locomotive tenders whilst running, and enabling a constant stream of water to be maintained through the wheel. The arrangement, which is a very convenient one, is clearly shown by Figs. 20 and 22, and it acted exceedingly well during the experiments. We may remark here, by the way, that observations which we made during the trials showed that about half the heat due to the work done by the engine was carried off by the water circulated through the brake wheel, the remainder being dissipated in the air, &c.

The engine we have been describing was erected by Messrs. Manlove, Alliott, Fryer & Co., at their works for experimental purposes, so that its capabilities might be thoroughly ascertained, and every provision was made for accurately determining its consumption of water per horse power, &c. The steam used was supplied by a boiler of the locomotive type, which we illustrate on page 2. This boiler was very large for the work it was called upon to do, so that the steam was readily maintained at a constant pressure, and there was little chance of priming. The chief dimensions of the boiler are given in our engravings, but we may remark that during our experiments, the grate was partially bricked up, its area being reduced to 4.06 square feet. With the fire grate thus bricked up the heating surface of the fire box was 64.24 square feet, while the tube heating surface was 252.8, and the smoke box heating surface 9.29 square feet, making a total of 326.33 square feet.

The products of combustion after leaving the boiler traversed a Twibill economizer on their way to the chimney, the feed water being passed through this economizer. The boiler above described was fed during the experiments by a donkey pump, the steam for working which was supplied by another boiler. The steam pipes connecting the boiler to the engine were wholly disconnected from any other steam pipes, and the safety valves were set to blow off at 90 lbs., while the steam pressure used was under 70 lbs., so that there was no loss at this point.

The feed water used was not drawn from the hot well, but from a main, it being run into a small tank provided with an overflow, and the contents of which up to the point of overflow were carefully checked by actual weighing. From the bottom of this tank was led a pipe provided with a cock, and by opening this cock the contents of the measuring tank could be run down into the tank from which the donkey pump drew its supply. This latter tank was filled up to a gauge mark at the

beginning of an experiment, and again filled up to the same mark at the end of the trial, each discharge of the measuring tank being booked by an assistant appointed to this duty. This observer also weighed the water discharged from the steam trap, which drained the cylinder jackets, the water so discharged being added to the water in the feed tank, and duly accounted for. Observations were also made every quarter of an hour of the temperature of the water supplied to the measuring tank, the temperature in the feed tank (this temperature being raised by the addition of the jacket water), and the temperature of the water leaving the economizer, a series of thermometers being provided for these observations, and the several thermometers being checked against each other.

In making each experiment, steam was got up in the boiler to the proper working pressure and the engine then run until the cylinders and jackets had been thoroughly warmed and all found to be in working order. The fire was then completely raked out and a new fire lit with a weighed quantity of wood and coal drawn from a supply which was carefully weighed out. Any further coal required during the run was also carefully weighed out by an assistant having charge of this part of the observations; each weighing being at once booked on the log sheet. The height of the water in the gauge glass was carefully marked at the commencement of an experiment and the same level was maintained at the end; the steam pressure was also the same as at starting. Observations were also made every quarter of an hour of the steam pressure and of the smoke box temperature, this latter being taken by a mercurial thermometer immersed in tallow contained in a tube which hung down within the smoke box. The stoking, we may say, was excellent, the steam pressure being maintained with great regularity. At the end of each trial the fuel remaining on the grate was raked out and the clinkers and partially burnt coal were sorted out and weighed separately. The coal used was Welsh coal of fair, but not exceptionally good, quality.

In the engine room the observations made every quarter of an hour included readings of the steam and vacuum gauges and of the counter, while indicator diagrams were also taken every quarter of an hour, from each end of each cylinder, four Richards' indicators being used the springs of these indicators having been specially tested. Reduced copies of some of the indicator cards taken during the run of March 1st, are given in Figs. 25 and 26 on this page.

Each of the trials of which we are speaking lasted eight hours continuously, and the results obtained are given in the table which we publish on page 3. The trial of March 1st was conducted under our own direction, while at the trial of March 15th, we were present a sufficient portion of the time to check the general results. In each case the observations were made with great care, and we have every reason to believe that they are entirely trustworthy. On the occasion of the trial of March 1st, the engine was run with a break load of 27 horse power, corresponding to 31.2 horse power indicated, and as will be seen from the table, the results obtained were exceptionally good, particularly when the small size of the engine is taken into consideration. Thus the weight of feed water evaporated per indicated horse power per hour was but 17.47 lbs., while the coal consumed per horse power per hour was but 1.6 lb. In the case of the trial of March 15, on the other hand, the load was increased to 34.14 horse power on the break, the mean indicated horse power being 40.7, and the consumption of coal and water per indicated horse power per hour being 1.8 lb., and 18.58 lb., respectively. These are not such favorable figures as those obtained with the lighter load, but they are nevertheless admirable, and altogether Mr. Halpin may certainly be congratulated on the results ob-

Fig. 13.

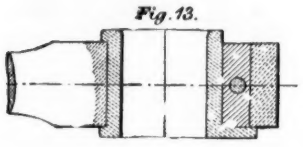


Fig. 23.

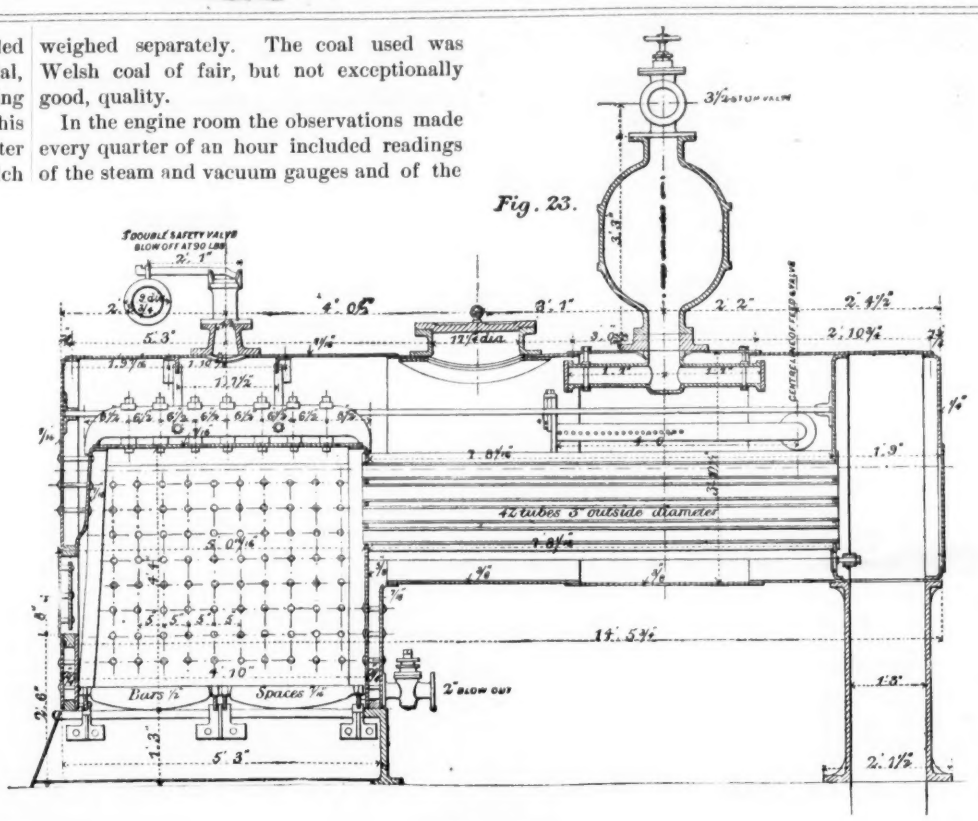


Fig. 24.

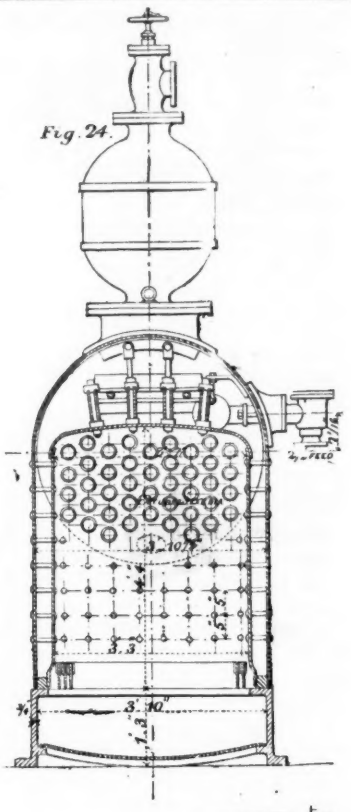


Fig. 20.

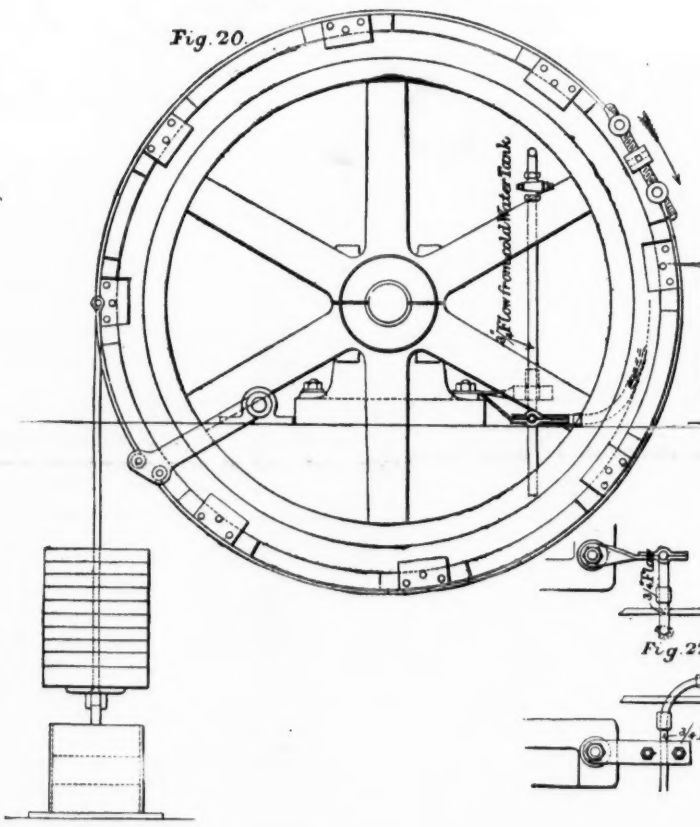


Fig. 21.

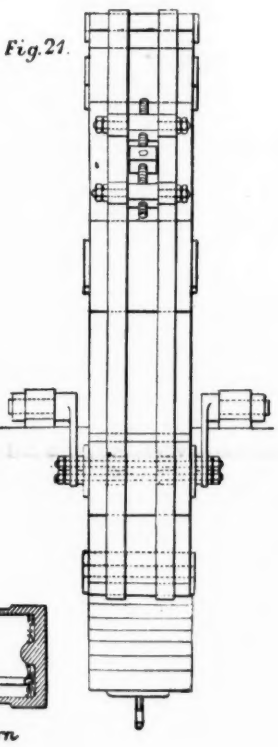


Fig. 22.

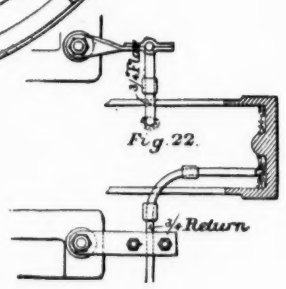


Fig. 25

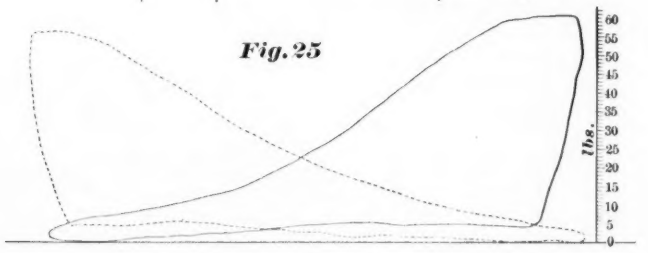


Fig. 26

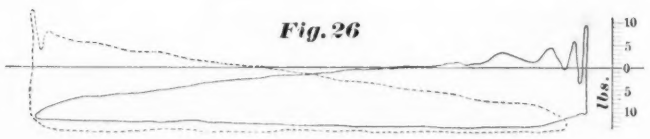


Fig. 17

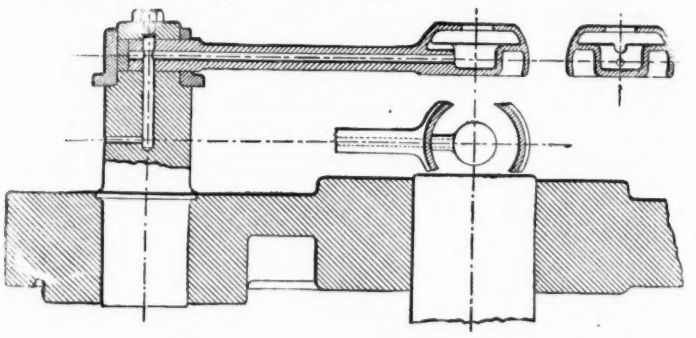


Fig. 10.

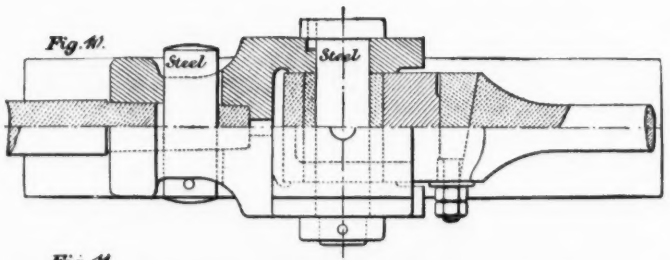


Fig. 11.

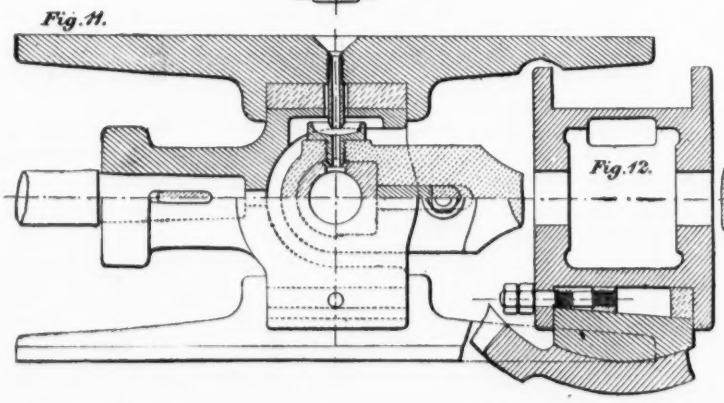


Fig. 12.

Fig. 16.

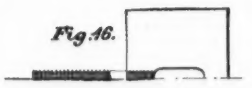


Fig. 15.

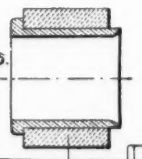
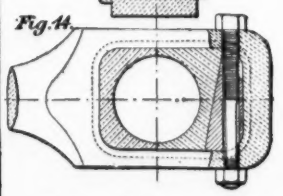


Fig. 14.



Different Sections.

tained. We should add also that during a great part of the trial of March 15, the engine suffered from a deficiency in the supply of condensing water. The condensing water used was drawn partly from a pipe connected with the town mains, and partly from a tank supplied from a well by a pump, neither of these sources of supply being sufficient in itself. During the trial of March 15, the well pump was disabled by the fracture of the pump rod, and during the latter part of the run the supply of town water had alone to be depended upon, this being very irregular, and it being necessary at times to so check the injection that the hot well temperature rose to over 120 degrees, the result being, of course, a temporarily impaired vacuum.

We consider that the excellent results which Mr. Halpin has obtained are in a great measure due to the exceedingly efficient steam jacketing which he has secured for his cylinders, these cylinders, with their steam passages and valve chests, being thoroughly surrounded by steam; while, as the steam circulates through the jackets on its way to the cylinders, there can be no accumulation of air. That the jacket worked well is shown by the high percentage of steam condensed in it; thus, on the trial of March 1st, the water discharged from the jacket amounted to 16.4 per cent. of the total quantity used. As we have already stated, the engine on which the experiments we have been describing were made was one which Messrs. Manlove, Alliott, Fryer & Co. had put down for experimental purposes; and we consider the makers are entitled to every credit for the manner in which they have had the capabilities of the engine thoroughly investigated.

TABLE GIVING RESULTS OF TRIALS OF HALPIN'S COMPOUND ENGINE.

	March 1, 1882	March 15, 1882
Date of trial	8 hours	8 hours.
Steam pressure, mean of observations made every quarter of an hour	65.5 lb.	65.1 lb.
Vacuum in condenser, mean of observations made every quarter of an hour	27⅛ in.	28.09 in.
Height of barometer, mean	28.65 in.	30.4 in.
Total revolutions made by engine	46,029 revolutions.	46,498 revolutions.
Mean speed of engine in revolutions per minute.	95.9 "	96.87 "
" piston speed in feet per minute	335.65 ft.	339.0 ft.
Indicated Horse Power (Indicator diagrams taken every quarter of an hour by four Richards' indicators):		
Mean effective pressure in front of high pressure piston in pounds per square inch	24 8 lb.	27.02 lb.
Mean effective pressure in back of high pressure piston in pounds per square inch	21.1 lb.	28.45 lb.
Mean effective pressure in front of low pressure piston in pounds per square inch	10.2 lb.	14.23 lb.
Mean effective pressure in back of low pressure piston in pounds per square inch	11.3 lb.	15.36 lb.
Mean indicated horse power in high pres'e cylinder	14.5 horse power.	17.66 horse power.
" " " " low " "	16.7 "	23.04 "
" total indicated horse power	31.2 "	40.70 "
Brake:		
Effective radius of brake	37⅛ in.	37⅛ in.
Load on brake	474¼ lb.	624 lb.
Mean brake horse power	27.05 horse power.	34.14 horse power.
Brake horse power or percentage of indicated horse power.	86.7 per cent.	83.9 per cent.
Water from Steam Jacket:		
Quantity discharged per hour	89.45 lb.	97.67 lb.
" " indicated horse power per hour	2.86 lb.	2.39 lb.
Coal:		
Coal fed on to fire during trial	404 lb.	593½ lb.
Wood used at starting	11 lb.=say, 4 lb. coal	12 lb.=say, 4½ lb. coal
Total coal fed on fire, including allowance for wood	408 lb.	598 lb.
Cinders weighed back from grate at end of run, taken as equal to half their weight in coal	13¼lb.=say, 6¾lb. coal	21¼lb.=say,10¾lb.coal
Total coal burnt	401¾ lb.	587¼ lb.
Ashes and clinkers made during run	28¾ lb.	32 lb.
Percentage of ashes and clinkers	6.1 per cent.	5.3 per cent.
Mean quantity of coal burnt per hour	50.2 lb.	73.4 lb.
" " " " sq. ft. of grate per hour	12.36 lb.	14.46 lb.
" " " " " heating surface per hour	0.153 lb.	0.225 lb.
Mean quantity of coal burnt per indicated horse power per hour	1.6 lb.	1.80 lb
Mean temperature in smoke box	382.4 deg.	392.3 deg.
Feed Water:		
Mean temperature in feed tank	69.7 deg.	73.4 deg.
" " leaving economiser	172.3 "	153.8 "
Quantity evaporated during trial	4,361 lb.	6,052 lb.
" " per hour	545.1 lb.	756.5 lb.
" " " per indicated horse power	17.47 lb.	18.58 ib.
Quantity evaporated per hour per square foot of heating surface	1.67 lb.	2.32 lb.
Quantity evaporated per pound of coal burnt	10.86 lb.	10.3 lb.

Extracts from Chordal's Letters.

BRASS IN RAILROAD SHOPS — RELATIVE STRENGTH OF SCREWS AND NUTS—REPAIRING A VISE IN A COUNTRY SHOP—HOW NATIVES OF INDIA MAKE HEAVY SCREWS WITHOUT MACHINERY—ERRORS IN LEAD SCREWS OF LATHES.

Mr. Editor:

* * * * Railroad shop men have a peculiar prejudice in favor of brass. The rack pinion under the apron of a lathe, after ten years of hard service, wears its teeth thin, and finally shells them off, like corn from the cob. This day comes, and always will come, with every lathe. The fractures are examined, and it is seen that the pinion is made of cast iron. This discovery brings on remarks concerning the reprehensible practice of private shops. A railroad man calls every shop a private shop not engaged in the repairing of old locomotives. A new pinion is made of brass, as it ought to have been in the first place, of course. It is put in place, and found to work all right. Now the thing is fixed for good. Future experience with this lathe shows that it requires two brass pinions a year to keep the thing going. The idea of putting in a cast-iron one is never suggested by the fact that the old one lasted for years. To make a running nut of brass seems to be the first thought in a railroad shop. This, of course, is proper where it is desired that the nut shall wear out and save the screw. It is always proper to throw the short life into the cheapest piece. A good hard nut on the lead screw of a lathe would be bad, because the nut is much easier to replace than the screw. The same may or may not be the case with the cross screw of a lathe.

With a short and simple cross screw, and a complicated nut difficult to get in line, the screw, of course, should be the most perishable member of the firm; while with a long screw, having fancy slot ways, etc., and perhaps having a cross-feed pinion solid with it, and a nut in the form of a simple block, every effort should be made to secure long life to the screw, even at the sacrifice of the nut. In the design of machinery a great deal of judgment has to be worn out in determining into which of two pieces to put the most hardy constitution. Ordinary bench vises involve the question of judgment in the highest degree. To make a new nut for a vise is a small job if there is a small tap to suit it; but who ever heard of any of the square-threaded taps about the shop coming in handy to fix up a bursted vise? When there is no tap, the nut is an ugly job. A new screw is almost always easier to make. It generally requires simply a new body to be welded to the old head. The question is not relieved of this principle, even if it is found that the nut and screw are both worn out. The question still is, in replacing both, which will we make the hardiest?

* * * * That old stand-by, the wrought-iron leg vise, has a wrought-iron nut of well-known form, with a chamber beyond the thread. Many a chap has wondered how these things were made, after he found out that they were a plain, rough forging inside, and not bored.

* * * * The common country blacksmith, a hundred miles from a machine shop, who never saw nor heard of a screw cutting lathe, makes no bones at all of fixing his vise, whether it requires a new nut or a new screw or both. In repairing the nut he goes at it as follows: He chips all of the old, played-out threads out of the nut, and then files the hole as clean as blacksmiths generally file things. He then forges from nail rod a string of iron about an eighth of an inch square. He coils this string around the old screw between the old threads, fastening it temporarily. He cleans these up some with a file and pokes the whole thing into the nut. He now unscrews the screw and leaves the coiled thread within the nut. He then doses it with brazing stuff, puts it in the fire, and in 10 minutes the deed is done. It is not only done, but it is well done—in fact it is done exactly as it was originally manufactured. If he now wishes to make a new screw he follows about the same plan. He skins the old thread off, winds on a double coil to space the thing properly, takes one coil off and brazes the other one on. When the job is done, it looks as though it had just come out of a hardware store.

* * * * When the steel jaws in a vise give out, the country blacksmith has a much harder job than repairing the screw, but he accomplishes it, nevertheless. These jobs of steel facing a comparatively heavy piece of iron will sometimes get away with the best of blacksmiths, let alone the old country chap who calls a well-made mule shoe the noblest work of man. I know one of these old fellows who was five years, on and off, trying to fix a new face on his old anvil. The anvil wasn't worth a new face even if he could have put it on in half an hour.

* * * * One of the engineers of the great India and Peninsular R. R. in India, told me that he quit work and loafed a month to watch the natives build some heavy press screws without machinery of any kind whatever. There were eight screws five inches in diameter, twelve feet long, threads about one and a-half inches pitch. The natives worked out doors in the sand; far away from anything suggestive of art or industry.

They secured bars of native iron, excellent in quality, but neither round, straight, nor of uniform diameters along their length. They filed these bars bright and wrapped around them, spirally, a ribbon of some fiber, the space, &c , being regulated entirely by accurate native eyes. They then made mud-lined trenches which they filled with some kind of home-made acid. They soaked the screws over night in this acid, and in the morning had a well-developed corrosion in the way of a thread. They then neutralized the acid by bathing the screws in water, after which they stripped off the fiber and set to work with chisels and files and cut the threads to proper depth. Here were screws, but they were not round, nor of uniform pitch, nor with uniform thickness and depth of thread. They then made a mould in the earth and stood a screw upright in it for a core. A long nut of native brass was then cast upon the screw. The nut was then worked loose and the screw chipped at and filed at till the nut would run from end to end. This was one step towards uniform accuracy. The nut was then melted and cast again upon the screw. The screw was re-dressed till this nut would run all right.

This kind of business was kept up till about twenty nuts had been used for each screw.

My friend said that the final work was as perfect a job of nut-and-screw fitting as he ever saw in his life. There was no perceptible difference to be felt in running a nut from end to end on a screw.

* * * * It is not uncommon in our Southern States to see old sugar-cane presses built entirely of wood, with a wooden screw about five feet long, 14 inches in diameter and with a thread, as near as I can remember now, about three inches wide, which would be six inches pitch.

The nut is formed in two immense wooden blocks firmly keyed together. These screws and nuts are cut out with a mortising chisel, mallet and saw. The work is all accurately marked off, geometrically, before the cutting is commenced. Many of the southern millwrights particularly pride themselves on their ability to lay off these nuts and screws. The student in mechanical drawing who has advanced to the projection of a section of threaded nuts, would probably find himself stumped if he attempted to put his knowledge into practice by laying off the lines in the hollow cylindrical surface of a half nut.

* * * * Few lathesmen ever lose faith in the accuracy of the lead screw of a lathe. If they will take a walk along the length of a lathe they will be able to see the difference between one part and another.

The actual number of threads to the inch make but little difference because they can do whatever they wish to do with the aid of the change gears. But it is very important to know that the number of threads to the inch is regular throughout the length of the screw. A ten thread screw should have a hundred threads in ten inches; but measure one and see about it. One inch will be found to have ten threads; the next, ten and one-hundredth, perhaps; the next, some other trifling variation; and so on throughout the length. Not only will every inch vary from the other inches, but one thread is likely to be a different pitch from the thread right along side of it.

It will be at once seen that the screws made by the natives in India were probably much more accurate than they would have been, if they had been cut in a lathe with the lead screw in the ordinary condition.

* * * * Lathe makers throughout the the world follow the plan of cutting their lead screws from a master screw, procured from the shop of Sir Joseph Whitworth & Co., in Manchester, England.

Whitworth early discovered that screws were not accurate enough, even for ordinary shop work, and at once commenced to produce a reasonable standard. As near as I can understand the matter, Whitworth's work stood unquestioned just so long as it stood untested.

Every one who has gone into any class of work which was to be based on the accuracy of a screw, such as measuring machines, graduating machines, &c., &c., has quickly found that the best screw to be had was a Whitworth screw, and that a Whitworth screw was not good enough for the work.

These parties have generally contented themselves by using a Whitworth screw in connection with a device for correcting the errors discovered. Some of them have gone into the matter of constructing an original screw, by methods which will in themselves insure the accuracy of the work.

I understand that The Pratt and Whitney Company, in the construction of their gauges, have determined to go the bottom of the thing, and that they are now in the midst of a laborious research after an accurate inch and a screw of uniform pitch.

* * * * One of the Whitworth devices to overcome errors was as follows: He cut ten screws a foot in length, taking great care in the operation to use the same part of his lathe screw all the time. When these short screws were done, they were, of course, copies of a single foot of his old lathe screw. They had the errors of that foot, but had not the errors of any other foot. He then bored a hole through these screws and faced them accurately to a length, testing them in his measuring machine which measured to the millionth part of an inch. He then strung them on a bolt and thus made a long screw of them, of which every foot was bound to be the same. There might be twelve different kinds of inches in each foot, but the feet were uniform.

He then made a nut of great length so that it could not be said to be governed by any one particular inch of a foot. The nut was longer than a foot, and thus became operated on by at least two of the sections at once.

With this built-up screw he cut a long screw and it looked as if he had certainly eliminated all sources of errors. But still the first close tests made of them showed that no one thread was like any other thread, and that no one thread maintained a uniformity of spiral during its complete, single convolution.

* * * * *

Very respectfully,

CHORDAL.

Meeting of the New England Cotton Manufacturers' Association.

The New England Cotton Manufacturers' Association held their thirty-second meeting in Boston, at the hall of the Massachusetts Institute of Technology, on Wednesday, April 26. The meeting was called to order by the President, John Kilburn, agent of the Lawrence Manufacturing Co., of Lowell.

The reports of the Secretary and of the Treasurer showed the affairs of the association to be in a flourishing condition, the membership numbering 230, and the finances showing there is no debt and a surplus of about $1,200.

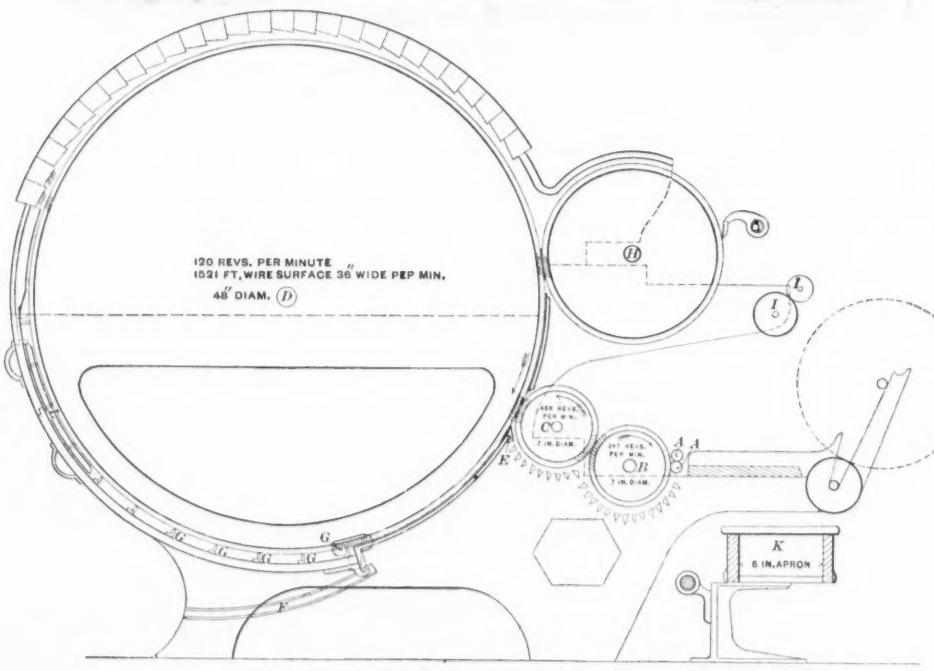
The annual balloting for officers resulted in the election of John Kilburn, of Lowell, President; William F. Goulding, of Lewiston, and Richard Garsed, of Philadelphia, Vice-Presidents; also a Board of Directors.

A new cotton card was the subject of a paper by William E. Whitehead, of Lowell, and described a new form of card invented by that gentleman. Col. Samuel Webber read the paper, as Mr. Whitehead was detained at home by sickness.

Of the important features claimed for this card, the most desirable were the measures taken to separate the leaf and dust by an extractor under the cylinder, which is very efficient in its operation, and disposes of the foreign matter before the cotton reaches the top flats. The cylinder is much larger than usual, being 48 inches in diameter, so that the centrifugal force is less than in the usual variety of cards, for a given velocity of surface. There are twenty-seven top flats; and the surface of the first licker-in is 867½ feet per minute; of the second licker-in, 1,170 feet per minute; and of the cylinder, 1,521 feet per minute. The stripper operates in five seconds, which is about one-third the time required for other strippers.

The capacity was stated as 70 pounds per day in preparing for No. 30 yarn.

This new card is built by the Whitehead & Atherton Machine Company, which has been engaged for many years in manufacturing pickers.



New Cotton Card.

This paper gave rise to a general discussion upon the subject of carding, different members comparing their views and experiences in the use of lickers-in. The general practice seems to be rather against their use, except for finer numbers.

John C. Hoadley, C. E., gave some of the results of his elaborate experiments upon the operation of boilers at the Pacific Mills, with a special reference to a determination of the value of an "abstractor," invented by Obadiah Marland.

This is a regenerative device which utilizes a portion of the waste heat in the chimney, by warming the air fed to the fire, instead of heating the feed water, as is generally the aim of the regenerative attachments applied to boilers.

It consists of a number of thin tubes, which convey the products of combustion to the chimney. Around these are larger tubes open at the end, and the air supporting combustion passes through this annular space between the tubes, and reaches the fire in a heated condition.

The experiments were made on two similar boilers, one of which was provided with this regenerative apparatus.

These experiments have occupied several months, but the details are the property of those at whose instance the investigation was carried out, and the paper considered those principles of combustion which have been more strongly brought to light in the course of this work.

In addition to the usual data of weights and temperatures of fuel and water—the temperature of the air and calorimetry of the steam—these tests proceeded with great refinement to analyze the coal, ash, cinder and gaseous products of combustion; a very precise calorimeter being used to measure the heat in the steam. The high temperatures on the bridge walls were obtained by means of balls of known specific heat, made of platinum and other metals, which were immersed in water in a small calorimeter.

The chimney and other brickwork was covered with a coat of asphaltum, because so much air passed through the brick walls, as to interfere with the analysis of the products of combustion.

These investigations were not made with a view to accomplish the "combustion of water," or any searching for methods of "burning the products of combustion;" but the work was undertaken to ascertain the amount and nature of the losses in the combustion under the boilers, and the best methods of modifying these evils.

It was found that the losses due to incomplete combustion were very small, the amount of carbonic oxide being only $\frac{8}{10}$ of one per cent., the proportion of loss from this incomplete combustion being seven to eight times the percentage of carbonic oxide.

When the fires are banked, the proportion of carbonic oxide is greatly increased, the losses being about 37 per cent. of the coal burned.

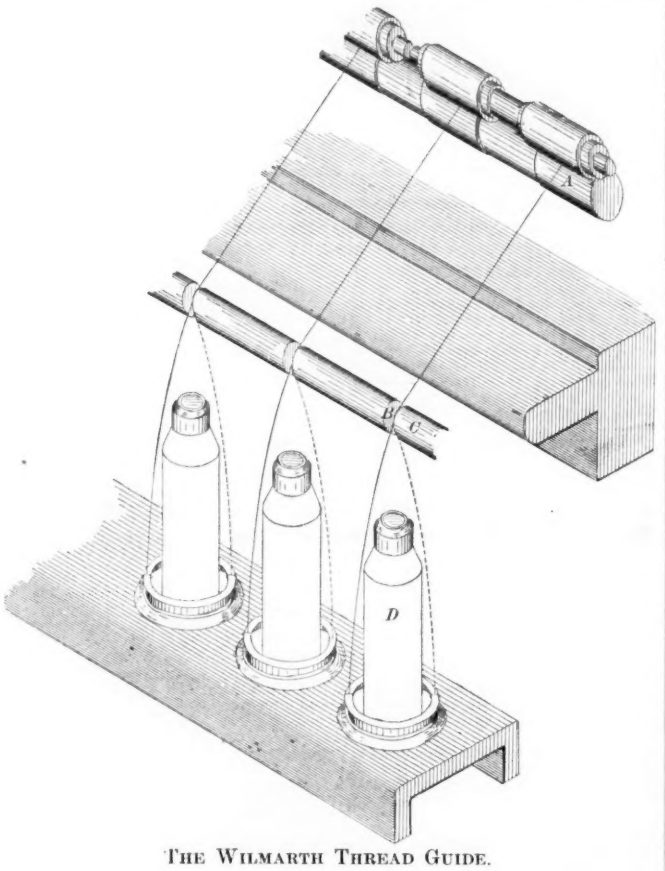
It was found that the fire doors were open for the purpose of feeding and cleaning fires 4 to 6 hours per week. For the perfect combustion of 1 pound of carbon, 2.66 pounds of oxygen are required which calls for a supply of 11.29 pounds of air, containing these 2.66 pounds of oxygen, making the whole product of combustion 12.29 pounds.

As a matter of fact, an excess of air amounting to about double this quantity must be supplied to enable a sufficiency of air to come in contact with all the burning fuel and insure complete combustion; and the trials showed that 25.93 pounds chimney gas was necessary per pound of coal. By the use of the Marland abstractor, previously described, the heat in the chimney was reduced 177° Fahrenheit. The specific heat of these chimney gasses was .239; or for 25.93 pounds it equaled that of 6.17 pounds of water; and for a reduction of 177 degrees in the heat in the chimney, it represented a saving of 1094 thermal units of coal, adding to each pound of coal the additional capability of evaporating 1⅛ pounds of water from and at 212°. The saving obtained by the use of the Marland Abstractor was found to be 15¾ per cent. with bituminous coal and 12.87 per cent. with anthracite coal. Of the theoretical caloric efficiency of the coal, 78 per cent. was obtained with the ordinary boiler, and 87⅛ per cent. with the use of the regenerative attachment.

After the noon recess, Edward Atkinson spoke of the injury to the cotton crop by poor ginning. He estimated that the crop was depreciated one cent a pound by avoidable bad handling between field and factory; and this amounts in the aggregate to an annual damage of $30,000,000. Others considered this amount too small, and state that double this damage more accurately represents the true loss.

The total output of a cotton field would be more valuable if the cotton was ginned more slowly, and more of the short staple left on the seed. There are practically two varieties of staple in each boll of cotton, the longer filaments, which comprise the true spinning fiber, and the short hairy fluff, which should be left upon the seed and removed by a linter and used for batting or mixture in coarse yarns.

As a matter of fact, the incentive offered to purchasers of cotton gins by the salesmen, is the statement that their special gin will gin more rapidly and clean the seed more perfectly than those of their competitors.



The Wilmarth Thread Guide.

Certain men interested in the manufacturing of cotton goods are now about to start a cotton ginning establishment in co-operation with some progressive southern cotton farmers. Their object is to gin and pack the cotton in the best manner for their own use, and to transact the business with an ample capital, paying cash for all the cotton brought to the door.

It is probable that this will meet with opposition on the part of the storekeepers, who now purchase cotton on credit, paying for it in goods previously delivered at excessive profits. This arrangement of establishing cotton ginneries will be an especial benefit to the small farmers, who are rapidly increasing in numbers.

A paper by A. F. Nagle on Loss of Power in Line Shafting, was read by title.

On the question of mill lighting, Edward Atkinson said that the introduction of water gas, which is valuable for heat but not for illumination, bids fair to solve the problem for a small cheap power, and thus supply the missing link in the application of electricity to its best advantage in lighting mills. He had been informed that the cost of generating this fuel gas was less than 15 cents per thousand feet, and that its calorific value was about half that of coal gas. Frederick Grinnell spoke of his use of gas engines, and that their operation was perfectly satisfactory. C. J. H. Woodbury spoke of the construction of the gas engines, and referred to the establishment of Sleicher, Schumm & Co., in Philadelphia, where several hundred gas engines, from 1 to 25 horse power, are made every year. A gas engine consumes about 21½ feet of coal gas, or about 40 feet of fuel gas, per hour her horse power, under the best conditions of full capacity of engine.

Water gas, enriched by hydrocarbons from petroleum to fit it for illumination, is now in use in 60 gas works in this country, but only at Yonkers was the fuel gas made on a large scale.

Reference was made to a paper upon the subject of fuel gas, read by Dr. Henry Wurtz, before the American Institute of Mining Engineers, in 1880, and contained in Vol. VIII. of their transactions.

Thomas Pray, Jr., spoke of the importance of gas engines as an auxiliary motive power in repair shops of large corporations, and referred to a recent instance where an accident to the large engine of a mill disabled the shop from making repairs, until they had removed a gas engine from a printing office to the repair shop which was done in four hours' time.

A lot of chinese clothes all of hand-made fabrics were shown. It was stated that the rate at which these clothes were made per operative is about one-hundredth that of power-made goods.

In reference to experience with the Garland atomizer, the results seemed to be extremely favorable to its use with fine goods, but that for coarse or low sleighed goods, unless the atomizers were in operation a long time before work commenced, the work would be uneven.

Speaking of the importance of atmospheric conditions in manufacturing textile goods, Mr, Atkinson said that there was a *reason* why 8,000,000 spindles were in Oldham. The town was not located there as a mere chance, but is situated on the edge of a moor where the humidity is great.

A device for spinning frames which Thomas Wilmarth used at the Dyerville mill, of which he is superintendent, was sketched on the board by C. J. H. Woodbury. A long roller parallel to the front rolls and nearly over the spindles, revolves with the same surface velocity as the front rolls, but in the opposite direction; Scores are turned in this auxiliary roll where the thread passes over it. The result of this arrangement throws the twist to the bite of the front rolls, enabling them to keep the twist more uniformly, and does away with thread guides.

This substitute for the wire thread guides, relieves the yarn from excessive tension, so that the number of breakages is greatly reduced, stretching is prevented, and therefore the yarn is more even. In a frame, spinning number 30 yarn, with this attachment on one side, there were only three-fourths as many breakages, as on the other side where the ordinary guides were in use.

For doffing, this roll may be moved away, although this is not necessary in spindles like the new Rabbeth, where the bobbin can be drawn off at an angle, after it is lifted slightly; in such cases a sufficient clearance is obtained, if the attachment is 2½ inches above the spindle.

Frederick Grinnell stated that four years ago he read a paper on the new automatic sprinklers just then introduced, and compared the chilly reception then given to the idea of conducting a system of pipes, filled with water connected with reservoir pressure throughout a mill, with the present general adoption of automatic sprinklers as the only device capable of protecting such combustible property as textile mills. Automatic sprinklers have extinguished 34 actual fires without a single failure.

This session of the meeting was well attended and the time for discussions fully occupied by remarks of the members. This interchange of opinions and expressions by those concerned in the manufacture of cotton goods is in marked contrast to the exclusive policy of foreign manufacturers.

The Association presented to the department of mechanical engineering of the Institute of Technology a set of models of the arrangement of belts and pulleys for certain difficult problems in the transmission of power. These problems formed the subject of a paper by Nathaniel Hill, C.E., before this Association at the November meeting (see AMERICAN MACHINIST) and were of such importance that the Association had this duplicate set of models made, to be used for purposes of instruction in the Institution which has hospitably given them the use of their hall at their semi-annual meetings for many years.

Boiler Construction and Setting.

The Hartford Steam Boiler Inspection and Insurance Co. publish in the last issue of their *Locomotive*, cuts showing design of a horizontal tubular boiler with attachment and setting, which, by their permission, we present on this page, together with their description, as follows:

The proportions of this boiler are somewhat at variance with the present practice among boiler makers. and we would not recommend its adoption except after careful examination of all the surroundings. The quality of water and fuel used are important considerations—also the draft. The dimensions of the boiler are as follows: 21 feet 4 inches long outside, 66 inches in diameter; tube heads 20 feet apart; 54 tubes, each 4 inches in diameter. The front is known as the "cutaway" projecting front. The braces are attached to pieces of T iron arranged radially on each head, as shown in Fig. 2. The heads above tubes are stiffened by these pieces of T iron. There are two nozzles, one for safety valve and one for steam.

The boilers are constructed of steel plates ⅜ inch thick; heads, steel ½ inch thick.

Horizontal seams double-staggered riveted.

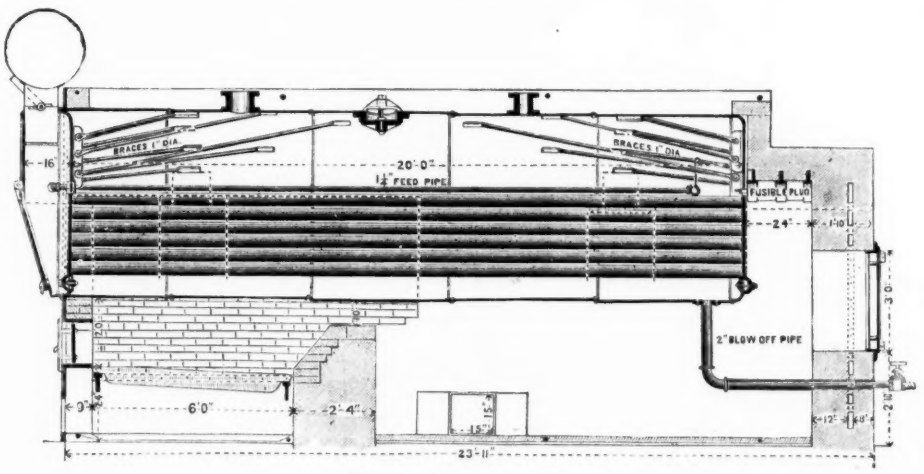
The setting is so planned as to secure the best effect of the radiant heat; at the same time there is ample provision for a proper mingling of the gases with atmospheric air. The ash-pit bottom is a water basin, in which four or five inches of water are constantly kept. No ashes or cinders should be allowed to accumulate there, but should be raked out as often as the fire is cleared and replenished.

These boilers are working fully up to our expectations. The gases are well-consumed, and with soft coal very little smoke is ever detected issuing from the chimney. Properly constructed and properly set, we regard it as one of the most economical and easily-managed boilers in use.

The Commercial Club of Chicago, in order to assist in the supplying of skilled mechanical labor, are about to establish a school in that city, on a plan similar to that of the manual training school in St. Louis.

A Large Steam Engine.

An engineer and the senior partner in a large manufacturing concern, relates that several years since the agent of a trade journal called at the works with a view to business. Having on hand a second-hand engine, taken in trade, it was concluded to try the virtue of a short "ad" by the way of aiding in its disposal. When in due time the journal containing the "ad" made its appearance, there was some little surprise at finding that they had been made to appear as soliciting a purchaser for an engine 28 *feet* bore and 60 *feet* stroke! He however pocketed his surprise and the "ad," which latter he clipped from the paper and concluded to preserve as a curiosity. Some time afterwards, and during the progress of the Centennial Exhibition at Philadelphia, business called him to a New York office, where a returned sight seer was demonstrating by the aid of his note book the wonders of the exhibition, first and foremost amongst which was the Corliss engine, which he noted on the authority of some unknown but responsible party to be the largest steam engine ever built. Several gentlemen present were disposed to question the accuracy of his note on this particular subject, but were unable to quote any figures to compare with his notes of dimensions, and finally appealed to the engineer for his opinion, who modestly suggested that many steamships were fitted with much larger engines, but his remarks were by no means convincing. Finally a brilliant idea struck him, which was no less than to put the nearly forgotten "ad" to some use (they hadn't had any inquiries for an engine 28′×60′), so he quietly produced and gravely presented it as an argument in the case. The result was all that could be desired, the maker of the note book admitting without further argument that he had been misinformed.



BOILER SETTING.—Fig. 1.

LETTERS FROM PRACTICAL MEN.

The Use of Crude Petroleum as Fuel.

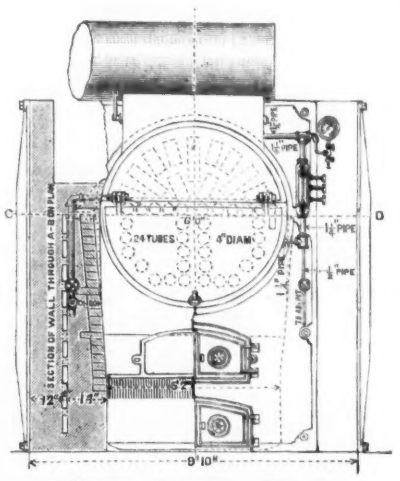
Editor American Machinist:

Ever since the time of the production of large quantities of petroleum in Pennsylvania, we have frequently seen in the papers a paragraph to the effect that "So-and-so, an ingenious inventor, has discovered a method of burning petroleum, which is destined to supersede the use of coal. This remarkable invention has been examined by shrewd capitalists, newspaper reporters, and others, and is pronounced the greatest invention of the age," &c., &c. This paragraph by the help of scissors and paste, travels the rounds, is dropped for a few days, and then started again on its travels with trifling variations. So it has traveled for twenty-five years, and yet to-day there is no case outside the oil regions, where the oil is used as a practical commercial success as a fuel under steam boilers or for metallurgical purposes.

There is a sort of fascination to the mind of the inventor in the thought of using petroleum fuel. The ease with which it is kindled and regulated by merely turning a valve, its apparently great heating power and the absence of ash, causing him to spend his time and money in experiments which are but the repetition of many which have gone before.

There are three leading methods by which petroleum has been consumed experimentally as fuel, the object of all having been, to effect perfect combustion and non-production of smoke.

First: By running the oil into open pans



BOILER SETTING.—Fig. 2.

containing asbestos, or fire brick, with suitable openings for admitting air from below, and intimately mixing it with the vapor or flame.

Second: By blowing the oil into the furnace by a jet of steam—after the manner of the "Atomizer"—together with air from the combustion.

Third: By the retort system—in which oil, air and steam are heated in a closed vessel of any convenient form placed in the furnace. The resulting mixture of gases and vapors escaping from suitable burners is then consumed.

In all these systems there is advantage in using brick linings, and bridge walls, in the furnace, for the purpose of keeping the temperature high and uniform.

To show the comparative cost of the heat to be obtained by the combustion of petroleum, or of anthracite coal, we may have recourse to what is known regarding the calorific values of the chemical elements of those fuels, assuming petroleum to be a pure hydro-carbon, composed by weight of ⅛ hydrogen, and ⅞ carbon. The calorific value of one pound of carbon is given in the books at 16,000 heat units; of hydrogen, at 64,000 heat units, and of a *gaseous* hydro-carbon at 22,857 heat units; a heat unit being an amount of heat that will raise the temperature of one pound of water one degree Fahrenheit.

A fair sample of anthracite may be considered as composed of combustible carbon, .80, and ash, .20; then $16{,}000 \times .80 = 12800$, the heat units to be obtained by the combustion of one pound of this fuel.

Taking the cost of coal in New York at $4.50 per ton, and petroleum at $12.00, we would have

$$\frac{12800}{4.50} = 2844$$

heat units obtained from coal fuel at a cost of one dollar, and

$$\frac{22857}{12.00} = 1904$$

heat units at an equal cost using petroleum fuel.

Then

$$2844 - 1904 = 940$$

and

$$2844 : 940 :: 100 : 33$$

—that is, with equal cost the petroleum fuel gives 33 per cent. less heat than the coal fuel.

Some experiments made by myself and others 15 years ago on a large scale using anthracite and petroleum fuel, in a marine boiler gave an evaporation of 9 pounds of water per pound of coal. And 11.7 pounds of water per pound of petroleum.

They showed the calorific effect of the petroleum to be but 30 per cent. greater than that of the coal proving that the assumption that petroleum is a pure hydro-carbon is erroneous, also that considerable heat is required to be expended before getting it into the *gaseous* condition so that the 22,857 units of heat may be obtained by its combustion.

Taking the above-mentioned experiments as a basis, with an evaporation of $2240 \times 9 = 20160$ pounds of water per ton of coal costing $4.50, and $2240 \times 11{,}7 = 26208$ pounds of water per ton of petroleum costing $12.00, we have

$$\frac{20160}{4.50} = 4480$$

pounds of water, evaporated at a cost of one dollar using coal, and

$$\frac{26208}{12.00} = 2183$$

pounds of water evaporated at a cost of one dollar using petroleum. That is, the cost of petroleum fuel is about double that of coal fuel, while evaporating the same amount of water in a marine boiler. Notwithstanding this extra cost there are no doubt cases in which petroleum fuel may be used to advantage, but whether petroleum will remain at its present exceedingly low price of $1.50 at New York is one of the things which the speculators in "futures" would very much like to find out.

Braintree, Mass. WM. H HARRISON.

Understanding Mechanical Subjects.

Editor American Machinist:

Having noticed in your columns the inquiry, "What shall mechanics read?" I thought a few suggestions might not be amiss. There seems to be a complaint among a portion of your readers that they do not understand a portion of the writings of practical men. If they will take any one item in which they are interested, read carefully, think over the subject, and then by a practical demonstration satisfy themselves, never leaving it with doubt in their minds, or accept it because it is given on good authority, they will form a habit of study and thought that will amply reward them for the trouble. The principal object in reading mechanical journals should be to suggest ways and means, and, to a great extent, leave the reader to solve the problem.

"Extracts from Chordal's Letters" is an excellent book to read; but it is useless to read it and then throw it aside without further thought. "Bilgram's Slide Valves and Gears" is well explained and illustrated, but I doubt if there is one in a dozen that will fully understand it without a practical test and drawing made by himself.

J. L. S.

Corning, Iowa.

The Plumb Bob Question.

Editor American Machinist:

In No. 148 of "Questions and Answers," in the issue of April 29, H. E. G. asks if the point of a plumb bob, suspended by a long line, will describe a circle?

I have witnessed an experiment which demonstrated that the plane of oscillation of a pendulum (simply suspended) will rotate about the vertical line once in twenty-four hours. As a long plumb line is rarely at rest, this rotation will make the bob appear to move in a circle.

C. S. LORING.

Pattern Makers' Troubles.

Editor American Machinist:

What are the pattern-makers doing? Are they, like myself, afraid of writing what everybody knows, or do they "know it all" and want to keep it to themselves.

I devour the weekly installments of Mr. West, and find them nourishing. Pattern makers say that moulders never think, and they often seem to have justification for the assertion, but Mr. West is a standing proof against the charge. By the by, it seems as if I have heard moulders make the same charge against pattern makers.

Sometimes I wonder if it pays to bother about thinking.

Take the case of a man working in a job shop; up comes the foreman in a great tear, "Here's a job I want right off—never want more than one casting, just a cheap job." Well, the pattern maker looks it over and finds he can make it one way in three hours and it will take five hours to mould it, but if he spends another hour on the pattern it can be moulded in half the time. So he decides in favor of the latter course.

Result: "What did you do that for? Why didn't you make it so and so?" "Well, it saves so much time in moulding." "Oh! Dash the moulding, they could get it out;—want the thing cheap."

Moral: Do as you are told and don't think.

Another time he may have to cut up a hundred feet of lumber and spend three or four days making another cheap pattern, when a couple of loam boards to use on green sand, *a la* Mr. West, would have answered as well.

I hope it is different elsewhere but, where I am, every cent spent for pattern making is grudged.

Now I know that most people who bring little jobs to a shop, grudge pattern makers' time, and I don't blame them, because they don't understand it.

They are apt to think that a thing they don't want, and couldn't sell for ten cents, is pretty dear at ten dollars.

But it frequently happens that employers have the same complaint, and I do blame them because they ought to understand it, if they don't.

PAT. MCKER.

Improvement in Foundry Ladles.

Editor American Machinist:

Having received a number of useful hints from correspondents in your columns, and thinking it only fair that those who receive benefits in that way should *try* at least to return favors, by showing hints they find useful and things not generally used, I enclose a sketch of a slight improvement in the ordinary foundry ladle which I use.

The ladle shanks used in iron foundries are always much heavier than are needed. If makers would only use a small flat rod in

connection with the shank, extending from one round part of shank to the other *underneath* ladle and fastened with clip on ends, like that shown in the sketch, the handles would have more strength with about half the ordinary weight, and moulders (especially in a country jobbing foundry) never have muscle to spare to carry around one hundred per cent. of extra dead weight.

J. E. M.

Wellmar, Minn.

The Angle of Threads.

Editor American Machinist:

I take exception to Mr. Simonds' method of laying out the angle of threads, as it seems to me to give the *apparent* angle rather than the real one.

I claim that under the conditions he names a line should be drawn to a point ¼" (which is the pitch) at a distance representing the *circumference* of the screw, which calling the diameter 1 would be 3.1416; this would give the *correct* angle of the thread at the top. A sketch will plainly show the difference between the two methods.

As the angle at the bottom of the thread is greater than at the top, I should say the proper way to make a gauge would be to lay off a distance representing the *circumference* of the *bottom* of the thread (if that is a correct term) and set off the *whole* pitch.

Boston, Mass. GREASER.

Some few Hints on Machine Construction.

Editor American Machinist:

I have often wondered why about 99 out of every 100 manufacturers of machinery persistently use square shoulders and corners in every place on their works where it was possible by any means to do so. The heads of bolts almost universally join the body by a square shoulder. If the bolt is turned and finished, they try and see how sharp they can make the angle, by squaring up the head on the under side with a side tool. If there is a collar welded to the middle of a rod, they square the collar up to the rod, making the sharpest corner possible. The ends of all the journals must be squared up to a sharp corner. The threads of all the screws and bolts have to be cut down to a sharp V—the sharper the better (excepting when the American standard screws are used, and in these as shown are two sharp corners at the bottom of the threads, which, as I will explain hereafter, are a little less objectionable). If there is a handle, or column, or any other finished piece, it seems from the usual practice that there must be some bead or other flummididdle work put on, for no other evident purpose than to catch dirt and get full of gum.

Now, I would like to have some of these right or acute angle men "get right up in meeting," and tell me why "this is thusly."

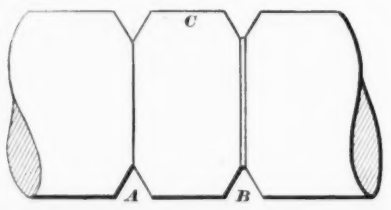
Probably there is not one mechanic in a hundred who does not know the following facts:

First, that if you take a long bolt, say, 1½" or 2" diameter, and say 10 feet long, having a head joining the body with a square shoulder, and hit it a good, smart blow near the other end. the head is quite likely to either fly off or crack sufficiently to break off at the shoulder when subjected to a little strain.

Second, that if a shaft or wrist pin breaks, it almost invariably breaks at the square shoulder; or if a valve rod or any other rod breaks, it is when some pains have been taken to see how square a shoulder can be made at that point.

Third, that in cleaning up machinery it is always so difficult to sharpen a stick, and dig the gum out of the fancy-beaded places, that they are usually neglected, and the gum so accumulating will seem to grow like a fungus, and in a short time envelope the whole machine.

Now my experience and observation has told me that whenever a machine breaks down the break will, 99 times in a 100, occur at one of these favorite corners, and an examination of the construction will disclose no reason why a sharp corner was essential to the working of the machine. If a bolt



breaks it is always either right at the square shoulder or through the thread Speaking of threads, let any one take a piece of inch steel and true it up and turn two grooves in it close together as shown in the sketch, giving to the cut *A*, the form of a *V* thread and to the cut *B*, the form of the American or Franklin Institute thread, then rest the ends or supports and break by a blow at *C*, and tell me where it will break; then try a similar experiment with the groove *A*, made with a round bottom and the groove *B* as it is. My experiments in that line have always shown the superiority of a round bottom. Whenever the framing of a machine breaks it will almost certainly start from some angular corner, that might just as well have been rounded out.

I can hardly conceive of any piece of machinery which will be subject to jars and strains when the corners, if made round, would not fulfill every purpose, and add to the life of the part. Of course there are undoubtedly many places where the action of the machine may depend on the sharp true corner, but unless this be the case, why make them, unless to make business in repairing?

Round corners are easily wiped out and they are just as easy to make. Bolts, in which the head joins the body by a true, nice curve will stand two or three times the strain and jar as when made in the usual way, and why in the name of common sense are they not so made? GEO. B. FOOTE.

Helena, Mont.

A NEW COUPLING JOINT.

Coke vs. Coal for Foundry Purposes.

Editor American Machinist:

At your request, we herewith give you our experience with coke for foundry purposes:

Price of 72-hour Connellsville coke at ovens, per net ton.	$1 75
Freight to Hartford.....	5 15
Total cost on cars at works.	$6 90
Hazelton lump coal, cost per net ton at works.....	$6 02

Duty of coal, 6 to 1, or $1 per ton for melting.

Duty of coke, 8 to 1, or 86c. per ton for melting.

We can melt with coal in a No. 4 McKenzie cupola four tons per hour. With Connellsville coke can melt six tons per hour. The castings made from coke melting are softer and cleaner. Another argument in favor of coke is that not more than one-half the power is required for the blast.

The above figures are based on about eight-ton heats. For a larger heat better economy would be obtained.

THE PRATT & WHITNEY CO.

Hartford, Conn.

New Universal or Variable Coupling Joint.

Numerous attempts, attended with more or less success, have been made from time to time, to do away with noisy gear transmission, or indirect and not less unsatisfactory belt transmission, in the case of driving a shaft making an angle with the driving shaft. The engravings presented herewith represent a universal, or variable coupling joint, designed by William Johnston, 224 South Third street, Philadelphia, Pa., for the accomplishment of this purpose, of which it is said that having been in practical operation for some months at speeds of from 250 to 1,200 revolutions per minute, it has demonstrated its capacity to fulfill all the requirements of noiseless operation and steady transmission, without developing objectionable features.

The cuts, Figs. 1 and 3 represent different forms of this coupling as suited for different conditions of transmission, the principles of construction however being identical.

As shown in Fig. 1, the coupling is more especially designed to connect two shafts at right angles, as there shown. In this case the two parts *A*, and *B*, are miter-faced, and by moving in contact assist in preserving steadiness of motion when running at high velocity. The coupling as shown in this figure may, however, be used to connect two shafts making any angle whatever, less than 90°, with each other, as the positive driving is done through the short shaft connecting the two parts, *A* and *B*.

In Fig. 2 are shown the parts of this coupling separated, being referred to by letters corresponding to the letters in Fig. 1.

Fig 3 represents a coupling without the shafts, and in which, as will be seen, the connection *E*, is of considerable length. This connection can be of any length desired, and the length may at any time be modified to suit changed conditions. By reference to Fig. 4 it will be seen that each coupling is made in halves longitudinally, which are held together by bolts in a manner common to split couplings.

In Fig. 5 is illustrated the working cylinders *DD*, with the connecting shaft *E*. The cylinders are made of phosphor bronze and the shaft of tempered cast steel.

As will be seen, these couplings may be used for connecting shafts at any desired angle, to 90°, or, shafts that are presumably in line, but that are liable to unavoidable derangement which, with a rigid coupling would cause damaging friction, or a serious breakdown.

All detail and principles of construction, as well as the possibilities of application, are made so plain by the illustrations as to need no explanation.

Utilizing the Room Under a Lathe.

It is a well known fact that there is no room in a machine shop more completely wasted—so far as all *useful* purposes are concerned—than the floor space under an engine lathe, that is, a lathe of a capacity to be mounted on legs reaching up some distance from the floor. Tools belonging to the lathe cannot be kept there, as they will get covered with dirt and chips. Two other facts are equally apparent, one of which is that there is about an ordinarily constructed engine lathe an entire lack of room for the necessary tools and appliances, such as change gears for screw cutting, chucks, &c., &c., and the other that the chips falling on the floor find their way under the feet of the workmen to the detriment of his comfort and peace of mind generally.

The accompanying engraving represents an arrangement devised by Mr. Warren, of the firm of Moore & Warren, 57 John Street, New York, and which he kindly consents that we may give away for him.

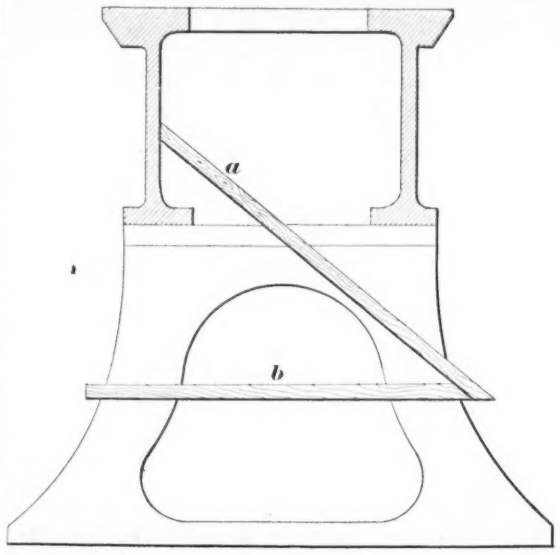
In the use of this little arrangement, for which Mr. Warren claims nothing except that, so far as he knows, the idea is original with him, three things are accomplished: First, it provides for keeping the floor on which the operator stands clean. Second, it provides a shelf on which the lathe belongings can be kept quite free from chips and dirt; and, third, it provides a means for depositing the chips quietly at the back of the lathe where they may be allowed to fall on the floor, or may be caught in a box if desired.

There is one other thing that may be of interest, and that is that the whole arrangement costs about 75 cents.

As will be seen, two pieces of board the length of the lathe and arranged to be supported by the legs, is about all that there is of it. One of these boards, *a*, is placed aslant and forms an apron, down which the chips find their way, and the other, *b*, forms a shelf for the tools, this shelf being entirely protected from chips and dirt.

The apron can be arranged lower in the lathe bed than represented, if there are cross ties in the way, or the board can be notched to pass over the ties. The shelf should be of such a height from the floor as to admit a box underneath to catch the chips, at all times, if desired, and particularly to be used when turning brass.

Several of the main streets of Vienna have been illuminated by means of the Brush electric light since the beginning of January. The illumination is only a temporary arrangement in order to test the efficiency of the system, and the company will receive in return an amount equal to the cost of the gas lighting during the course of the experiments. There are 14 lamps of 2,000 candle power each, supported by columns some 16 feet high and about 131 feet apart. The current is transmitted through a copper wire 3.5 millimeters in diameter.—*Engineering.*



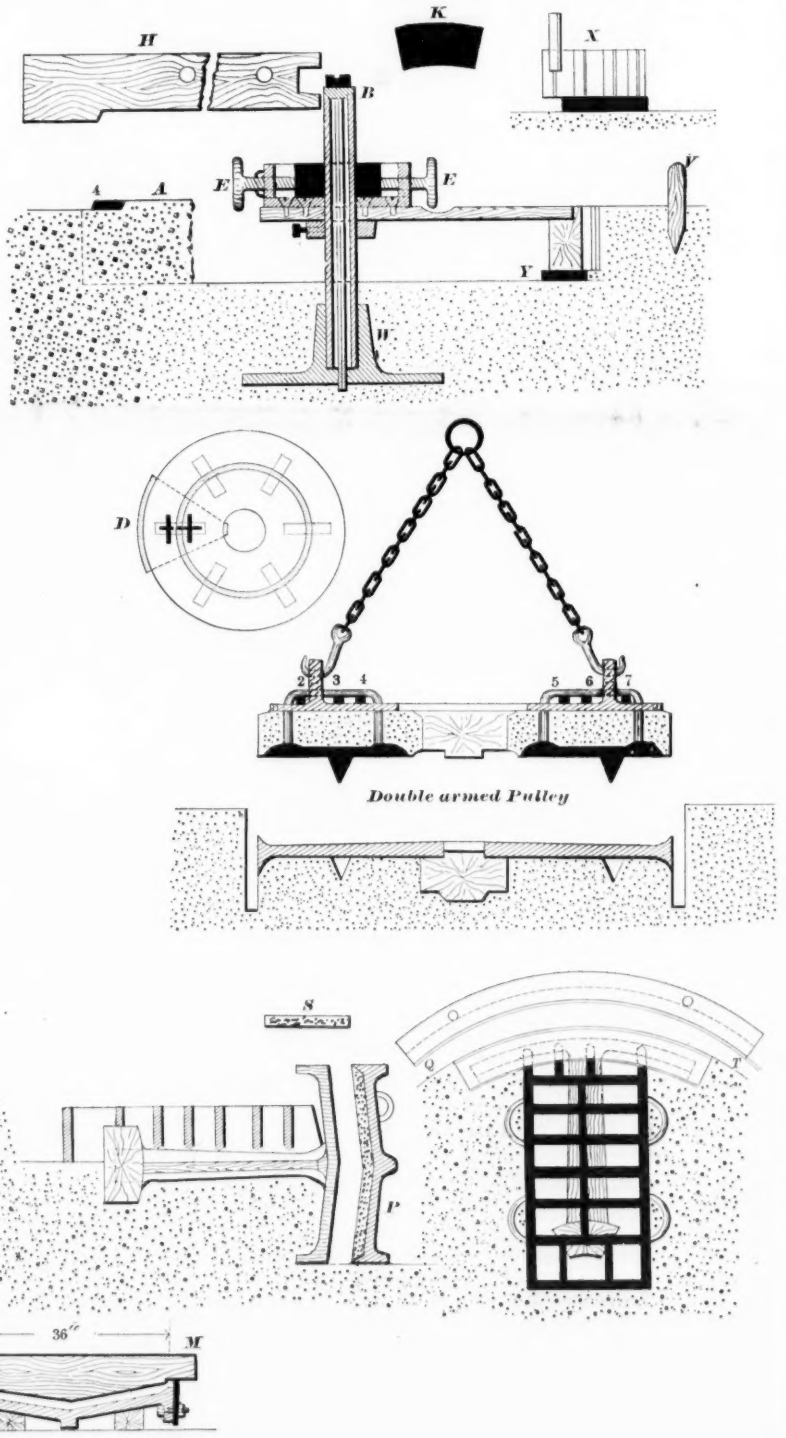
Improved Methods of Moulding.

BY THOMAS D. WEST.

The methods or riggings for moulding, illustrated in this article, are those in use for moulding gear wheels and pulleys in the shops of the Cuyahoga Works, Cleveland, Ohio, and which I am kindly allowed to present by their permission. The upper cut shows the process of moulding a spur gear wheel having a top and bottom shrouding on it, using only a small segment and arm core box to form or make the casting from.

The difference between moulding a wheel having a shrouding and one that has none, will be better understood by referring to the article entitled "Moulding Bevel and Spur Gear Wheels in Green Sand, Without a Pattern," published in AMERICAN MACHINIST, March 25, 1882. In moulding this shrouded wheel, the tooth segment *X* require to have one tooth loose and long enough to come down on the sand bed, so that every time the segment is drawn it can be replaced exactly, according to the marks made on the sand, as described in the article referred to. The flat loose segment *K*, after the level bed is made and spaced off, is set on and the tooth segment is set on top of it as shown at *Y*. The teeth are then rammed up and the tooth segment drawn, after which the segment shroud is drawn in, and then replaced and the tooth segment reset. Then more teeth are rammed, and so on until the circle is completed.

To form the top shrouding on the wheel, the sweep *H* is secured to the spindle and a solid hard bed is swept up as shown at *A*. The outside edge, 4, could be formed by having wooden segment pieces laid all around, if so desiredal though this is seldom done. After this bed is finished, the cope is set on and rammed up, and being well staked, is then lifted off. A hole the right diameter and depth is then dug out, the bottom bed swept up, and the teeth and lower shrouding formed as described. After this, green or dry sand cores are set in to form the arms and hub, and the cope is closed on, having the stakes as shown at *V* for a guide.



Mr. J. F. Holloway, the president of the Cuyahoga Works, has designed a spindle for such class of sweeping, that will not shake or turn over from the weight of a heavy sweep. The spindle is made of a heavy tube from 2″ to 4″ diameter. The outside is trued up and the ends faced off. The spindle seat *W* is bored out straight so as to be a good fit, and the hollow spindle is set into it. At the bottom of the spindle seat there is a $\frac{5}{8}$ or $\frac{3}{4}$ hole bored, and a thread tapped in it, and when the spindle is set in a turned washer having a projection set down into the spindle is placed as shown at *B*. Then the long bolt, having a head on one end and a thread on the other, is set in and screwed down tight. By this means a spindle from 6 to 8 feet long can be held as firmly as if there was an arm or brace attached to the top of the spindle, as is generally done with spindles that have heavy sweeps attached to them.

The next improvement, and one that is worthy of note, is Mr. Swift's (the foreman of the works) rigging for moulding double-armed pulleys, entirely of green sand. The cut represents the lower arm as being moulded. The draw rim pattern has been drawn and the core hoisted up. The arm and hub pattern is then drawn, and the core lowered down into place. The draw pattern is then set back, and the iron or wooden wedges, Nos. 2, 3, 4, 5, 6, 7, are withdrawn. The top lifting plate is then hoisted off, the loose anchor plates remaining down, after which the upper arm and balance of the pulley is rammed up in the ordinary way. Instead of hoisting these cores with a chain, as shown, there is a three-winged cross used.

The cut shows a plan of the lifting plate, having one of the loose anchor plates wedged up to it. I think that the advantage of this rigging can be seen without further description.

The next and lower cut shows the manner of moulding some large pulleys, which were cast in segments and bolted together. When these pulleys were completed, they were found so true that they were only ground on the face by using a stone suspended by a rope.

In moulding these segments there was a full pattern used, but the outside face of the castings were formed by using an iron casing, well filled with vent holes. On the casing there was about 1″ thickness of loam swept, the process being shown at *M*. While this is being dried in the oven, the inside, arms and hub of the casting is moulded in green sand, as shown, the top of the pulley being kept about even with the level of the floor. After the lower half of the segment is rammed up and the joint at the center of the arm made, the iron cope is set on, rammed up and staked. The screws or bolts that are for holding the arm and face pattern together are then loosened, and the face pattern drawn back. After this the cope is hoisted off and the arm pattern drawn, and this part of the mould finished. The cope is then lowered down to place, the face pattern set back, and the balance of the mould rammed up. The face pattern is again drawn back, and this inside part of the mould finished, when the casing is taken out of the oven, lowered down, as shown at *P*, and, after it is pushed up against joints *O* and *T*, sand is rammed up at the back of it to the level of the floor. Covering cores *S* are then set on, and the mould weighted down ready for pouring.

Detroit, Mich., is to have an electric light of 32,000 candle power. It will be placed in the tower of the city hall.

The total production of anthracite coal from Jan. 1 to April 15, was 6,610,348 tons, against 6,721,875 tons for the corresponding time last year.

The increase in cotton spindles since the beginning of the year 1881 is, Georgia, 106,600; Tennessee, 24,000; Mississippi, 32,000; Louisiana, 21,000.

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NEW YORK, MAY 27, 1882.

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The United States Board on Tests.

At the present time, when the engineers and manufacturers of this country are so earnestly engaged in preparing petitions to Congress, to induce that body to pass a law establishing a board of experts to test full-sized specimens of iron, steel and other materials, it is well to call attention to the fact that such tests when made are of no value whatever to those who most desire them, unless they are published and issued in a way that every engineer in the country may procure such information.

We direct attention to the way and manner in which the first large report of the original board appointed to test iron, steel and other metals was disposed of by the Government. A limited number were printed and immediately (in the majority of cases) given to persons who had no use for them; therefore the work could not be appreciated.

That very valuable publication is now out of print and can be had neither for love nor money; consequently unless some steps are taken to effect its republication the time and money spent in its composition and in making those experiments have been in large measure thrown away. The second report or chemical part of those tests has never been published, although it has been in the hands of the Government printing department for several years. Unless it is soon issued it will be necessary to revise the data as the science of chemistry is continually progressing. Since the erection of the new Government testing machine by Mr. A. H. Emery at the Watertown (Mass.) Arsenal numerous tests have been made upon it. But aside from the obscure outlines of certain newspaper reports of isolated tests, nothing of practical value has been given to the engineers of the country. The machine was ready and the first year of work began in July, 1880, ending July, 1881. During that year the time was well and industriously employed. The tests consisted of full-sized specimens of latticed girders. Specimens of single and double-refined wrought-iron, transverse tests of pins, strength of timber, tensile, compressive and shearing; sliding and rolling friction were determined. The data, together with numerous other tests comprising the work of the entire year, were promptly made out and forwarded to Washington by Col. T. T. Laidley, in charge of the arsenal. This report has never been printed, although it contains information of inestimable value to engineers. Many have supposed that these tests were never finished, but this idea is not correct. The results of a whole year's work still lies in the Government printing office at Washington in type, and probably will until its publication is asked for by the engineers and builders throughout the country, or the Government printer gets out of a job and has nothing else to do.

A law ought to be enacted requiring *monthly bulletins* to be issued by the Board of Tests, when such a board is again appointed, which could be done with all propriety, embodying all data worked up at the time. All incomplete tests at the end of the month might be either deferred until complete, or, if likely to be of long duration, the information could be published as the work goes on. The printing of such reports or bulletins ought to be done as near where the tests are made as possible. To send proof to Washington and have it corrected involves the waste of too much time, and engineering tests are there considered of little importance compared to some political documents. There should be a perfect, uninterrupted system of issuing the monthly reports of tests; then at the end of the year the reports could be published complete, similar to the custom of issuing the papers read before the societies of engineers. If this plan were adopted, the reports would be made public more accurately and promptly. The data of tests of riveted joints made upon full-sized specimens, and embodied in the report alluded to, is something that every engineer needs, and yet they are as far from those who need them as if the tests had never been made.

The data connected with these tests could be used immediately by engineers and builders if they were within their reach.

A radical reform is necessary in regard to the manner in which the Government tests are published; and it is hoped the engineering societies will, by petition, bring the matter to the attention of Congress.

In regard to the accuracy of the testing machine, we may say that the Government board of experts were sent to examine the machine, and to report upon its merits.

A link bar of the shortest grain iron, five inches in diameter, was procured and attached to the machine. Different members of the Board took their stations to see how great the recoil would be upon the different parts of the apparatus.

The bar parted at a strain of 722,800 pounds, tensile strain, with a report so much louder than expected, that the gentlemen were too badly startled to testify as to the extent of the recoil. To prove that the machine had sustained no injury, a horse hair was put in place of the five-inch bar, and parted at a tensile strain of one pound. Pieces of the same hair were then tested upon a delicate weighing scale, and were broken at a strain of exactly one pound. The most remarkable and incomprehensible part of this test is that, before any effect is produced upon the specimen, 24,000 pounds of metal has to be moved; so the reader can realize in part how extremely delicate the parts must be balanced, to exactly record a strain of one pound upon a machine of so large a capacity. Since we have a testing machine which surpasses anything of the kind in the world, it is hoped that proper steps will be taken to make the best and most profitable use of it.

Proper Care of Tools.

One of our correspondents writes us as follows in a recent letter:

I quite agree with John Richards on the advantages of plain, stiff, powerful tools with large flat perfectly scraped surfaces, over light, ornamental, complicated, Connecticut clock machinery made lathes, inside of the apron. Bodmer aimed at perfection and took excessively good care of his machine tools. There are many of them made 40 to 50 years since, that are running to this day. He would not allow his men to lay anything on the lathe bed, but had boards to lay the tools on. One of his foremen told me he could always tell countrymen by their actions, such as hitting a tool with a wrench, hammering a piece of sheet iron on the lathe bed, laying hammers, files, tools and rough castings on well finished and scraped lathe beds. Tightening up jam nuts with a center punch, and other barbarous practices. Bodmer's tools after being in use for many years sold for above their cost when new, when he went out of business in Manchester.

It might be urged that in some shops where they want quantity more than quality, no time is allowed to wipe or clean a machine and the foreman is indifferent how short-lived a machine is, provided they knock out lots of rough work. In any shop where first class work is done, a careful mechanic that does his work so that nobody can do it better, and takes good care of his machine, will always be appreciated in the long run. A man that tries to take short cuts by dumping (grinding) a little off the extreme edge of his tools, and works with the point a quarter of an inch lower than the back, is invariably a butcher. When he attempts to make a finish with a coarse feed he makes it like a washboard or corduroy. The time that is spent at the vise afterwards in filing out the dull tool's clawing marks is never taken into account.

His excuse is, "let them file it; I am not going to take the time." A man that is particular in grinding his tools, and keeps them the same shape till they are used up, gives a tool dresser far less trouble than one of the above home-made mechanics. Mr. Richards says filing and polishing have given place to water-cut finish and scraping. There are men who advocate dry cuts and file rasping yet; in fact some lathesmen (I shall not call them turners) make excessive use of a file. They can finish nothing with tools; even a button-headed bolt, a handle, or any bulge or hollow, has to be rasped into with a file and then scoured with emery paper to try and take out the file scratches.

There is time to take care of the working parts of any machine while the cut is going on. Dirt and disorder in a shop result from working in a wretched make-shift "don't-be-so-particular" style.

Our correspondent is a little severe on careless workmen, but they deserve censure. The loss of value on a large plant of machinery by slovenly and careless manipulation is a large item in many machine shops. This loss is often neglected, because it does not appear charged under an appropriate heading in the monthly balance sheet. A slovenly workman, who is hired for a dollar a day less than a careful reliable one, sometimes spoils more than two dollars worth of work and tools per day, on the average.

The Effect of Extravagant Promises.

There is a somewhat familiar story of a man who upon estimating at the end of the week the probable results of adopting all the "improvements" offered during the preceding six days—improvements all looking to the saving of fuel in connection with his engine and boiler—found that so far from buying any more coal he could open a coal yard, with reasonable prospects of supplying a fair trade. Whatever of truth there may be, literally, in this story it is entitled to the legend—"Founded on fact."

In view of the general increase of knowledge in matters pertaining to steam engineering, it might with reason be supposed that extravagant assertions of prospective saving by the use of new devices, or by the re-employment of ancient contrivances, would be less frequent than when there was a good deal of excusable ignorance in relation to such matters. That is, this ignorance might be taken as an excuse why the inventor should, if quite honest in his intentions, deceive himself, or if not entirely sincere, should attempt to deceive the purchaser.

The *possibilities* of the use of coal, in connection with the steam engine, according to known methods, are made reasonably plain to those who read, or inquire. notwithstanding which there is apparently no end of those who are anxious to agree to reverse all known laws, by means which it is apparrent contemplate no addition to existing knowledge of the subject. Instead of decreasing, the list of wonderful steam motors and remarkable appliances that save considerably more than is wasted, were probably never so numerous as just now.

No exception can be taken to those who look to doing more work—in the steam engine for instance—for less money. On the contrary, any one who accomplishes a desired end in this direction, or even who honestly attempts its accomplishment, is in a plain sense a benefactor. There is no trouble with what *is* accomplished, but rather in the fact that the exaggerated statements of what *is to be* accomplished, serves the end of preventing the trial and probable adoption of really valuable devices. A wise man with a few hundred dollars, puts it into some institution that can afford to pay the interest it agrees to pay, rather than invest it with some one who offers 25 per cent. With equal reason the purchaser of mechanical devices inquires as to the possibility of the results talked of, and finding them impossible, sets the vender down as a fool or knave, exactly which making no difference in the consequences.

The mistake made in this respect, and it is a mistake that often results disastrously to the inventor or introducer, is that it is necessary to tell a large story to secure attention, while the fact is that no one likes to be approached as if devoid of ordinary intelligence. In effect, extravagant assertions of this kind made to those who, however limited their specific knowledge of the subject may be, are yet well enough acquainted with it in a general way to recognize their absurdity, have much the effect of intensely qualified expressions of any sort; that is, they discredit whatever of truth there may be in the entire statement.

We noticed recently in a circular of a new valve gear with which it is proposed to displace an extensively-used and reasonably-economical type of cut-off gear, a claim—made particularly prominent—of a saving of the new over the old of 50 per cent. For all we know to the contrary there are points of merit in the new arrangement that ought to bring it into immediate general use. If this is true it is a pity that it should go seeking public favor handicapped with such an ex-

travagant claim. The class of men with whom this is to find favor, particularly know that it is impossible that it should bring about any such saving, and it would seem that no better plan not to have it considered could be devised. As considerably better (?) than this, the result of the fuel economy of using a device in connection with a locomotive, a device which has for its principal object the bringing about of more cleanliness and hence comfort on the train, is given as more than 70 per cent! Such statements are simply absurd on their face, and the wonder is that it is not quite apparent that they go far to neutralize anything of good there may be in the arrangement.

The writer remembers, a few years ago, being applied to by a party—a stranger—to examine a grate bar for a boiler furnace, and, if thought well of, to give the exhibitor a note that might possibly assist him in making a beginning in the locality. It was purely a matter of good will that led him to accompany the inventor to an establishment for the purpose of introducing him to the engineer—a man who had grown old in the business, and whose word would be all-sufficient in the matter of its adoption, or at least its trial.

The engineer was favorably impressed, and, although using what he considered the best grate of which he knew, was quite determined to give the new grate a trial, until in an unfortunate moment the inventor sacrificed all possibility of his doing so by asserting that it would save 30 per cent. in fuel. The extravagance of the claim, perhaps in its effect heightened somewhat by the covert insinuation that thirty years of experience had only been sufficient to educate him up to waste 30 per cent. of the coal, effectually settled the grate bar, so far as that party was concerned.

As previously intimated, such assertions are entirely uncalled for, and always work to the detriment of the party making them. As a rule, purchasers are satisfied with a reasonable saving, and are more inclined to meet a seller who only promises what is at least possible, than one who promises impossibilities. Beyond the point of the selling of something of the kind referred to, the seller can never get so good a recommend as that of having it do more than he promised, nor so poor a one as the having it do materially less.

The effect of extravagant promises is entirely adverse to the interest of the seller—in the first place as operating against the probability of his selling what he has to dispose of, and in the second place as resulting in dissatisfaction, should he succeed in selling.

Alex. Gordon of the Niles Tool Works, Hamilton, Ohio, sailed for Europe on Saturday, May 6, by the Anchor Line, to be gone several months. His health has been threatened by too assiduous attention to the cares of a large and constantly growing business. His numerous friends will be glad to see him return, after a season's recreation, with restored physical vigor.

Literary Notes.

The Mechanical World is a new journalistic venture by J. H. Kerrick & Co., Minneapolis, Minn. It is a neatly printed and attractive monthly, devoted to mechanical matters, 16 pages, quarto. Subscription, $1 a year.

The *Northwestern Lumberman* of Chicago comes out dressed in a new spring suit (no overcoat) which fits admirably. This journal is all "clear stuff," no "rough common" stock finding a place in its 32 pages. It is an able representative of the lumber interests of the United States and Canada.

The *Blacksmith and Wheelright* has donned a new light blue spring overcoat, and presents other evidences of prosperity.

The *Boston Journal of Commerce* has been changed from daily newspaper size to the quarto form, 16 pages, cut and pasted. This makes it more convenient to read and to file away. It is a lively and progressive journal.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(171) J. E. G., Chester, Ill., asks: What will remove scale from the sides of steam cooking kettles? *A.* Try petroleum with the water.

(172) H. B., Corry, Pa., asks: What is the best and cheapest felting for cylinder jackets, to be used under cast panels? *A.* Mineral wool is highly recommended for such purposes. It is cheap in price.

(173) H. L., Holyoke, Mass., asks: 1. Can a paper machine be run on fast or slow speed with the same power? *A.* If you mean to ask if the machine can be run fast without using more power than when run slow, we should say no. If you mean to ask if the same steam engine or water wheel can be made to run the machine either fast or slow, we should say yes, if large enough. 2. Will a locomotive with large wheels run faster than if it had small wheels? *A.* Not necessarily.

(174) J. C., Genevieve, Mo., writes: I want to get a license to run a stationary engine. Is it necessary for me to be vouched for by an engineer? *A.* We do not know what the law may be in your locality, but do not believe that a license is required at all. You can find this out by inquiring. In any case we do not think you will be required to be vouched for by an engineer. If a license is required you will have to pass an examination before the proper board.

(175) T. M. H., Brantford, Ont., writes: Please name in the columns of your paper two or three of the best schools where a person could obtain a knowledge of the principles of mechanics and mechanical drawings. *A.* Cooper Institute, New York City; Stevens Institute, Hoboken, N. J.; Worcester Free Institute of Industrial Science, Worcester, Mass.; Massachusetts Institute of Technology, Boston, Mass.; Cornell University, Ithaca, N. Y.; Ohio State University, Columbus, Ohio; Lehigh University, Bethlehem, Pa.; Wisconsin State University, Madison, Wis.

(176) L. B. S., Jordan, Pa., asks: 1. How many threads to the inch should a ⅝″ bolt be for cast iron, also for boiler plate? *A.* The material into which the bolt is screwed is not to be considered only so far as having ample depth of thread to hold. We believe that 11 threads to the inch is the best for an ordinary ⅝″ bolt. For thin boiler plate a finer thread is preferable for most purposes; say 14 threads. 2. Why are are manufacturers making for a standard bolt both ½″ and ⅝″, 11 threads to the inch? *A.* We do not know of any manufacturers who are doing so. The standard for ⅝″ is 11 and for ½″ 13 threads.

(177) C.K., Camden, N.J., asks: 1. What is the difference between high and low tide at New York, and at Philadelphia? *A.* At New York from 3½ to 4½ feet; at Philadelphia, 5 to 7 feet. 2. When is the fog most regularly seen at these places? *A.* In the spring and fall. 3. When is the densest fog? *A.* Usually after midnight. 4. Would it be good practice to use wrought iron gibs on wrought iron slides? *A.* Cast iron or bronze gibs would be better. 5. What pressure would they stand at 400 revolutions, 2 feet stroke? *A.* This will depend upon the character of the lubrication. Perhaps 1,000 pounds to the square inch. It is better, however, not to subject the parts to this pressure if it can be avoided. The less the pressure the better. 5. What pump can I use to clean a dirty well, something that will pass sand? *A.* Try a pitcher pump. 7. What book can I get on modern machine tools that will give proportions of parts? *A.* We do not know of such a book. 8. By what means is the high gloss on shirt fronts produced? *A.* This is a matter of the whole processes of the laundry, which we cannot explain.

(178) C. A. W., Shephardstown, Mass., asks: 1. Can a pump be made to draw water perpendicularly if the end of the suction pipe is more than 33⅓ feet below the lower valve? *A.* It makes no difference how far the end of the suction is below the valve; it is the distance of the water below the valve that determines whether it is possible to raise it with the pump. It is not practicable to lift water as high as 33⅓ feet. It might be possible under favorable conditions, at the level of the sea where the atmospheric pressure would just about balance a column of water of that height. The height to which a pump will lift water depends on the pressure of the atmosphere, which is different at different heights from the sea, being less as the height increases; hence on a high mountain a pump will not lift water as high as it will at the level of the sea. The pressure also varies slightly at different times on the same level. 2. Will more water pass through one 12″ pipe than through two 6″ pipes, and if so, why? *A.* Yes. One reason is that the area of one 12″ inch pipe is just equal to that of *four* 6″ pipes. More water will pass through one 12″ pipe than through *four* 6″ pipes, the pressure or head being the same, because there will be more friction in the small pipes. The circumference of the 12″ pipe is 37⅝″, and the combined circumference of the four 6″ pipes is 75½″; hence the friction against the interior surface of the four 6″ pipes would be more than against the one 12″ pipe.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

We receive numerous inquiries relating specially to matters of private interest. While desirous to oblige our friends, we would suggest, that an advertisement of two or three lines under this heading will usually develop the desired information easily and quickly.

Portable Forges, $10. Holt M'fg Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

James W. See, Consulting Engineer, Hamilton, O.

C. A. Seley, Consulting Engineer, St. Paul, Minn.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Do you manufacture Hardware or House furnishing goods you wish sold in New York? If so, address Manufacturer's Agent, care of AM. MACHINIST.

The undersigned would be glad to obtain the address of a maker of augers for boring Pump Logs. J. C. Hoadley, 29 High street, Boston, Mass.

Machinists' Bench Tools; largest stock in the United States. Send for Machinist Catalogue, 212 pages. Tallman & McFadden, 607 Market st., Philadelphia.

We want to buy a Gear Dressing Machine, either new or good second hand. Address, with full description and price. Great Western Manufacturing Co., Leavenworth, Kansas.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, New York. Mention this paper.

"Slide Valve Gears," by Hugo Bilgram, published by E. Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut-off gears; price, $1.00.

Cumberland-Blossburgh Coal; the best blacksmith coal in the United States. Free from sulphur and earthy matter. Never clinks; forms a perfect weld. Shipped to all points west by C. C. & E. M. Johnson, Room 21, Coal Exchange, Pittsburgh, Pa.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

More than 50,000,000 square feet of Prepared Roofing used in the past ten years. It is now being put upon the best stores on Broadway, and upon the best and most costly dwelling houses built upon Fifth Avenue, New York City, with entire satisfaction. T. New, 32 John street, New York.

Steam Economy, by A. Wilkinson, M. E., No. 123 N. 4th street, Philadelphia, Pa. A new work on steam. Illustrated with numerous diagrams taken from engines in this country and in England. Points out and remedies defects in steam engines. Great variety of practical information for steam users. 124 pp., in cloth, $1.00 by mail.

If you desire to keep pace with the daily progress and development of Telephone, Telegraph and Electrical matters, have a copy of the NEW YORK REVIEW OF THE TELEGRAPH AND TELEPHONE sent to your address. Only $2.00 per annum. George Worthington, Editor and Proprietor, No. 23 Park Row, New York. P. O. Box 3329.

"Sibley College of Mechanic Arts, Cornell University.—Entrance examinations will be held June 12th and September 11th, 1882. For the register and catalogue just issued, containing reorganized courses of instruction, scientific and practical, including draughting, machine construction, general shop work, etc., apply to the President of Cornell University, Ithaca, N. Y."

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Ealy's "Blue Book,"—Special classified list of Machinists, Machinery, Railway, Engine and Boiler Makers supplies, etc., with financial standing and paying qualities of all dealers and manufacturers Much more convenient and reliable than any other work of the kind published. We also furnish full detailed written reports. Trial rate to July 1, 1882. The JOHN W. EALY COMPANY, 51 Chambers street, New York or 79 Dearborn street, Chicago, Ill.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 320 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Important to Millwrights, Machinists and Pattern Makers—I have compiled a complete and absolutely correct table of The Diameters of Toothed Wheels on Pitch Line, by which any mechanic can instantly find what he requires or wants, without calculating. This table should be in the chest of every mechanic and millowner, and in the office of every manufacturer, as it saves hours of time, and dollars of money. No algebra to learn, no arithmetic to study. I have also added the computation table of what is known as the "Manchester Principle." Price, $2 per copy. Address, Wm. T. Ross, care Bremaker & Moore Paper Co., Louisville, Ky.

MANUFACTURES.

Walter Brothers, of Bridgeport, Conn., are now making Small Iron Planers.

James B. Young & Co., Pittsburgh, Pa., manufacturers of rolls, have just finished a new office and an addition to their foundry, 90x40 feet.

The Niles Tool Works, Hamilton, Ohio, have closed a contract with the Northern Pacific Railway for a full outfit for their new shops.

Additional boiler shop and engine room is being added to the Auger Bit factory of James Swan, of Seymour, Conn.

Whitmore & Shoemaker, Buffalo, N. Y., employ 18 men from 12 to 14 hours a day, and are nearly six weeks behind their orders for drill presses and emery lathes.

Watts, Campbell & Co., Newark, N. J., have added to their works a building 120x45, two stories, and another to their foundry, 80x55, one story, and are erecting a room 75x35, one story. They are now running twenty-two hours per day.

The Bassett Foundry at Birmingham, and Farrell Foundry and Machine Co., of Ansonia, Conn., are getting out large machinery for the American Rubber Co., of Cambridge, Mass., who have under way a new factory 400 feet long and two stories high; also, three other buildings 60x80 feet each.

Sweetland & Co., manufacturers of the Sweetland Chuck, New Haven, Conn., have issued a very neat circular with new detail engravings of the chuck with its recent improvements. The merits of the chuck are mentioned only in the testimonials from leading establishments who have given it a thorough trial. These testimonials are certainly as favorable as any chuck manufacturer could wish for.

A New Haven correspondent writes us: "Wages of machinists in Connecticut are almost up to war prices, as they now command from $2.50 to $4.50 per day, but on the other hand, the cost of living in the Nutmeg State, is proportionately high, as a suitable tenement for a mechanic's family cannot be obtained in the larger towns, at less than $180.00 to $300.00 per annum, and the cost of staple articles of food are proportionately expensive."

The Harrison Boiler Works, now located at 15th and Wood Streets, Philadelphia, are building extensive shops at Germantown Junction, Philadelphia, which they expect to move into in July or August. The enlarged plant includes machine shops and foundry, and will be devoted mainly to the manufacture of the Harrison Steam Boiler. They expect to purchase a cupola and blower, a 25 or 30 horse power steam engine and some lathes and other machine tools. The new works have a side track connecting with both the Pennsylvania and Reading railroad systems, and will be well adapted to meet the wants of their increasing business.

Schleicher, Schumm & Co., manufacturers of the Otto Silent Gas Engine, have built and moved into their new shops, corner 33d and Walnut Streets, Philadelphia. The buildings are of brick, and handsomely built. The main shop fronts 200 feet on Walnut and 50 feet on 33d Street. In this building are located the office and draughting rooms. There is also a one-story annex, 50 by 100 feet, used for packing and shipping purposes, besides smaller out buildings used as blacksmith and pattern shops, etc. The firm now employ 100 men and would be glad to engage as many more good men. They are making Gas Engines as large as 25 horse power. Their business prospects are reported as excellent.

The Hendey Machine Company, Torrington, Conn., write us: About business! There is enough of it. We've been inclined to keep quiet of late. Not "speak in public on the stage." We doubled our producing capacity last year and are doing the same this year. Are running overtime, have nearly 100 hands, and are turning out on an average more than one machine a day, say equal to a 24″ shaper. We shall occupy our new addition within two weeks, with a 48″x48″x16′ Putnam planer, a heavy radial drill made by Judge Lewis, of Waterbury Farrell Foundry and Machine Company, some planers and shapers of our own build, a new Brainard universal milling machine and several engine lathes. Have just put in a Westinghouse engine, and in about six weeks shall put in a new 40 horse power Harris-Corliss engine, and a new boiler. Customers are begging and scolding, in turn; altogether we have fun enough and the noble aquatic fowl is suspended from a satisfactory elevation.

H. C. Francis, for many years with Wm. Sellers & Co., has bought the property situated on Beach and Vienna streets, Kensington, Phila., and associated with himself Wm. L. Simpson, formerly with Buckeye Engine Co., of Salem, Ohio, and John I. Boyd, formerly with Wm. B. Bement & Son, for the purpose of building The Buckeye Automatic Cut-off Engine. The concern will be known as the Kensington Engine Works, Limited, and has secured the exclusive license to manufacture and sell the Buckeye Engine for the Middle and South Atlantic States. The property purchased belonged to the old Beard & Huston concern and has water facilities; $12,000 worth of new tools have been added, and the shop considerably improved. In addition to building the Buckeye Engine, the new firm will continue to make tugboat engines, both high and low pressure and compound, also do general and river repairs and build special machinery from drawings or specifications.

Machinists' and Engineers' Supplies.

NEW YORK, May 11, 1882.

The general character of the supply market is quiet. Orders are small. The larger sizes of machine tools, such as lathes and planers are still scarce, but smaller sizes may be more readily supplied.

The Brass manufacturers, a few days since, held a meeting and reduced the prices of all goods except tubing, the discount standing at 30 per cent. off list, while tubing remains at 25 per cent. off.

Wrought Iron Pipe is still weakening and dealers are reluctant to give quotations, as the discount depends upon the size and character of orders.

Iron and Metal Review.

Nothing new in the Pig Iron market. Prices are still firm and unchanged with sales slow. Foreign Iron, we quote: Gartsherrie, at $26, other brands unchanged. Wrought Iron Scrap at $30 prime from yard. Steel Rails in fair demand at $50 to $52. Iron Rails, new and old, dull. Copper is quiet at 18¾c. for Lake Superior. Banca Tin 28c.; Straits and Malacca, 22c.; Billiton and Australian, 22c.; Spelter Domestic, 5.62c.; Refined, 8c. to 8¾c. Lead, 4.80c. to 4.05c. Antimony, Hallet's, 12c. to 12½c.; Cookson's, 14c. to 14½c.; Nevada, 13¼c.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A first-class planer hand on watchmakers tools. Address, Moseley & Co., Elgin, Ills.

Wanted—Five good moulders and five good core makers. Address, Holyoke Machine Co., Holyoke, Mass.

Wanted—By a young man a position as foreman and draughtsman, now occupying a similar position. Address Comadore, care AMERICAN MACHINIST.

Wanted—An agent to sell a first-class steam engine; must be competent to advise customers on engineering questions. Address, R., office AMERICAN MACHINIST.

Wanted—A good boiler maker to do general work on new boilers and repair old boilers. A steady job to a good, steady man. Address, stating age, kind of work can do, and wages, Geo. R. Lombard & Co., Augusta, Ga.

Wanted.—An experienced Traveling Man in the Injector business. One who thoroughly understands the trade, both practically and as a salesman. Give references and salary expected. Address, A. B., care AMERICAN MACHINIST

A man 31 years of age desires a situation in a machine shop as superintendent or foreman. 13 years' experience as apprentice, journeyman, toolmaker, draughtsman and foreman in Illinois, Iowa, Minnesota, Nebraska, Kansas and Missouri. Correspondence invited from parties who mean business. J. E. McConnell, Iowa City, Iowa

For Sale—One first-class Iron Planer 16 feet long, 60 inches wide; extra heavy, reliable tool. S. L. Holt & Co., 67 Sudbury street, Boston, Mass.

For Sale—An I. P. Morris Engine, sixteen (16″) by thirty-six inches (36″) cylinder, with governor. Also a fly wheel fourteen feet (14′) diameter and twenty inches (20″) face. Can be seen at works of Wm. Sellers & Co., Philadelphia.

For Sale—One 52″x52″ by 16 feet Planing Machine built by New York Steam Engine Co. Is in first-class condition, sold because it is too small for the business. Apply to Kensington Engine Works, Limited, Beach and Vienna streets, Philadelphia.

REMOVAL,

New York, May 1st, 1882.

E. & F. N. SPON, Publishers and Importers of Scientific Books, beg to notify their customers and and friends, that they have removed to 44 Murray street, one block from City Hall.

THE
Greenfield Vertical Engine,
SOLD BY
COOKE & CO., FORMERLY COOKE & BEGGS,
Dealers in MACHINERY AND SUPPLIES,
6 Cortlandt Street, New York,

IS THE BEST IN THE MARKET.

Send for our prices before ordering Engines, Boilers, or other machinery.

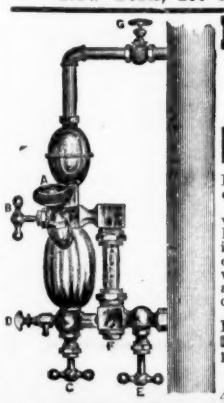
AGENTS FOR

ROOTS' BLOWERS,
WATSON'S FORGES,
WATERS' GOVERNORS,
KEYSTONE INJECTORS,
Etc.

KORTING CONDENSER,
SCHUTTE & GOEHRING, Manufacturers,
FOR
STEAM ENGINES, PUMPS, VACUUM PAN, OIL STILLS, &c.

Requires no Air Pump and no foundation. Only 15 ft. height of water required from level of water supply to discharge pipe, instead of 34 ft., whether above or below engine cylinder. Has fewer parts and is lower in price than any other condenser. Send for circular giving full information.

OFFICES AND WAREROOMS:
Philadelphia, 12th and Thompson Streets.
New York, 109 Liberty Street.



Holland & Thompson,
Troy, N. Y.
Manufacturers of the
HOLLAND
LUBRICATOR

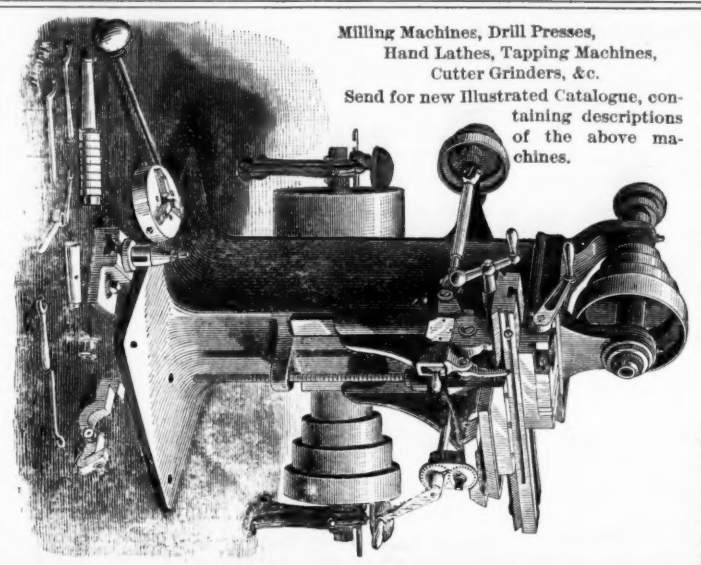
For lubricating the valves & cylinders of steam engines. Operating with **downward visible drop.** The Principle of this Lubricator is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other Patented Lubricator.

Protected with Letters Patent, granted July 5, 1881.

☞ A saving of from 50 to 90 per cent. in cost of oils.

For Sale by
H. PRENTISS & CO.,
42 Dey St., New York.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE N Y



No. 2 Power Milling Machine. Price, as shown in cut, $400.00.
Office and Works, 139-143 Centre St., New York.

Milling Machines, Drill Presses,
Hand Lathes, Tapping Machines,
Cutter Grinders, &c.
Send for new Illustrated Catalogue, containing descriptions of the above machines.

E. E. CARVIN & CO.
MANUFACTURERS OF
Machinists' Tools.

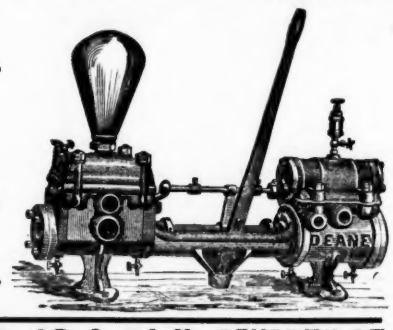
"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.

Send for New Illustrated Catalogue.

:o:

The Deane Steam Pump Co.
HOLYOKE, MASS.

92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.



KELLEY & LUDWIG 49 & 51 N. SEVENTH ST. PHILADELPHIA, Pa.

NEW IRON WORKING MACHINERY On Hand or for Quick Delivery.
Write for prices and particulars.

ENGINE LATHES.

38 inch, triple-geared (bed to suit).			Fitchburg.
22 inch swing,		14 foot bed.	Fitchburg.
21 "	"	14 "	Blaisdell.
20 "	"	14 "	Fitchburg.
20 "	" 12 and	14 "	Fifield.
19 "	"	12 "	Gray.
19 "	"	10 "	Gray.
17 "	"	6 "	Johnson.
16 "	"	6 "	Fitchburg.
18 "	"	10 "	Blair.
16 "	"	8 "	Fitchburg.
14 "	"	6 "	Hand.
14 "	" 6 and	8 "	Fitchburg.
13 "	"	8 "	Blaisdell.

PLANERS AND SHAPERS.

30 inch x 30 inch x 8 foot.	Fitchburg
18 inch x 18 inch x 4 foot,	Gould.
25 inch x 25 inch x 8 foot,	Fitchburg.
30 inch x 30 inch x 10 foot,	Hewes & Phillips.
30 inch x 30 inch x 6 foot, (English make.)	
12 inch stroke shaper,	Fitchburg.
10 inch stroke shaper,	Fitchburg.

DRILL PRESSES.

60 inch radial drill, double-geared, self-feed, planed and slotted bed-plate with portable table. Best English make. Weight 4 tons.
48 inch radial drill, self-feed, double gearing slotted and planed bed. Betts.
30 inch, back-geared, automatic. Prentice.
25 inch, back-geared, self-feed, Fitchburg.
18 inch swing, back-geared, Fitchburg.
18 inch swing. Reed.
17 inch swing. Blaisdell.

ENGINEERS' and MACHINISTS' DRAWING-BOOK.

A Complete Course of Instruction for the Practical Engineer, comprising Linear Drawing, Projection, Eccentric Curves, the various forms of Gearing, Reciprocating Machinery, Sketching and Drawing from machines, Projection of Shadows, Tinting and Coloring and Perspectives. Price $10, half morocco. Send 10c. for 112 page catalogue.

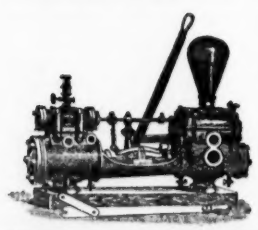
D. VAN NOSTRAND, 23 Murray & 27 Warren Sts., N. Y.

DRAUGHTSMAN ADJUSTIBLE T SQUARE

HARDENED STEEL BLADE	
24 IN. BLADE	$ 5.00.
36 IN. "	$ 7.00.
ARC $4.00 EXTRA 40 IN. "	$10.00.
50 IN. "	$15.00.

LEWIS G. CARR. 2227 TRENTON AVE. PHILA'A. PA.

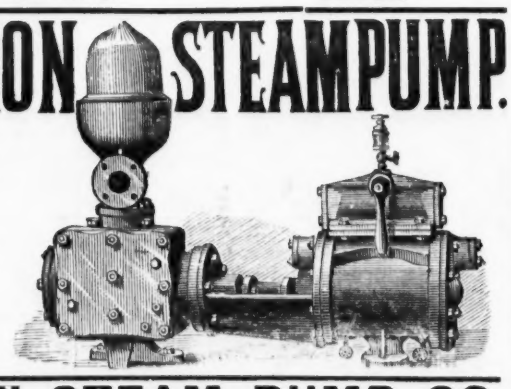
Knowles' Improved Steam Pumps,



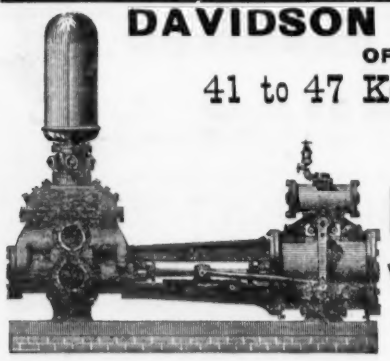
THE STANDARD!
Steam Pumps for Every Possible Service.
SEND FOR ILLUSTRATED CATALOGUE.
KNOWLES STEAM PUMP WORKS,
86 Liberty Street, NEW YORK. | *44 Washington Street,* BOSTON.

THE CAMERON STEAM PUMP.

Is the Standard of Excellence
AT HOME AND ABROAD.
THE A. S. CAMERON
STEAM PUMP WORKS,
Foot of East 23d Street, New York.

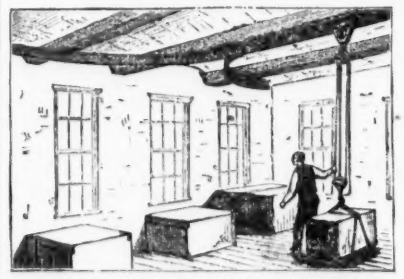


DAVIDSON STEAM PUMP CO.



OFFICE AND WORKS:
41 to 47 Keap Street, Brooklyn, N. Y.
MANUFACTURERS OF
THE M. T. DAVIDSON
Improved Steam Pump.
Warranted the Best Pump Made for all Situations.
KELLY & LUDWIG, Agents, 49 and 51 North 7th St., Phila., 97 Liberty St. New York.

OVERHEAD TRACKS,
WITH WESTON'S DIFFERENTIAL PULLEY BLOCKS.



OVERHEAD TRANSFER TRACKS.

Capacities from 1-8 Ton to 3 Tons.

The Weston Pulley Block is suspended from a traveler or trolley which runs freely on the lower flange of the track. The tracks by means of curves and switches can reach any desired points.
Plans and estimates furnished on application.

THE YALE LOCK MFG. CO.,
STAMFORD, CONN.
SOLE MAKERS.

SALESROOMS:
NEW YORK, 53 CHAMBERS ST. | BOSTON, 224 FRANKLIN ST | PHILADELPHIA, 507 MARKET ST. | CHICAGO, 64 LAKE ST.
40 Page Illustrated Catalogue of Light Hoisting Machinery sent free on application.

"STANDARD" GAUGE.
Any Size from ¼ inch to 6 inch.
Class "B" guaranteed to 1-10000th of an inch.
" "C" " " 1-5000th " "

Betts Machine Co.
WILMINGTON, DEL.
Manufacturers of
MEASURING IMPLEMENTS.

Standard Gauges,
Measuring Machines,
Adjustable Reamers.

NICHOLSON FILE CO.

SOLE MANUFACTURERS OF

FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES.

"Nicholson File Co's" Files and Rasps.
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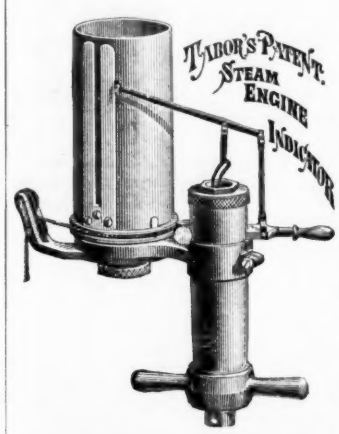

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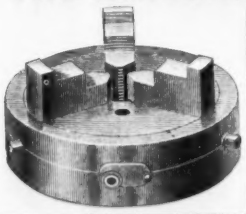

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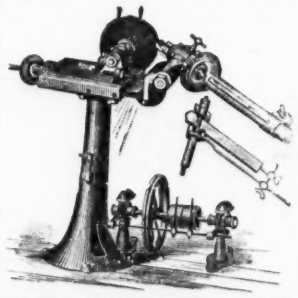

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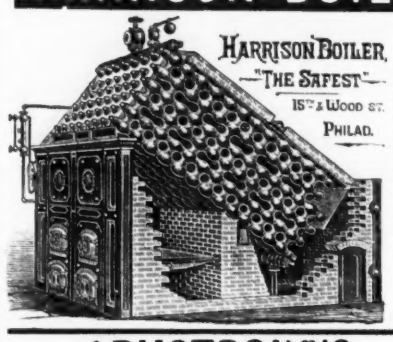

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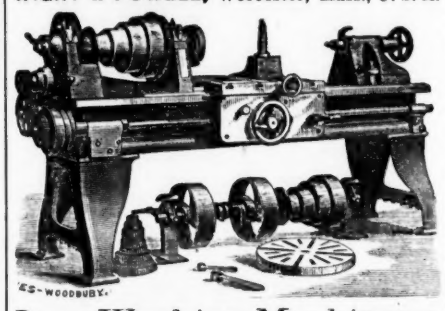

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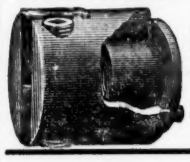

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" 10	1 1-2 "		1.10
" 11	1 3-4 "		1.25
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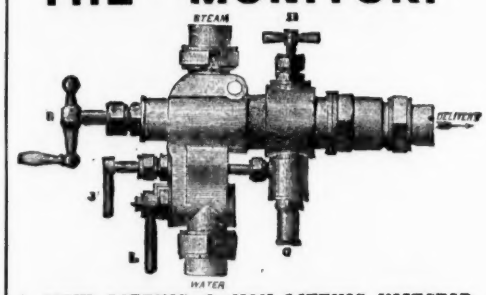

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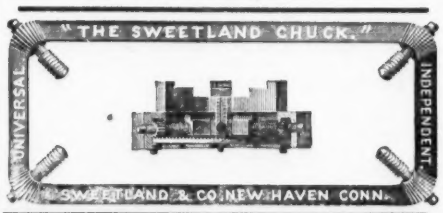

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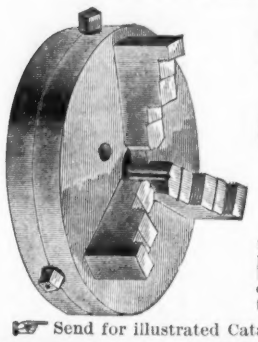

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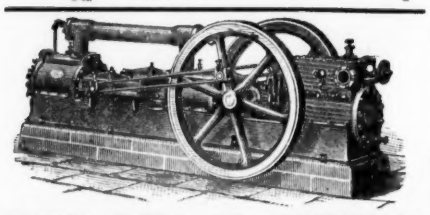

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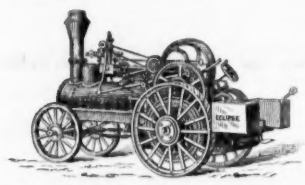

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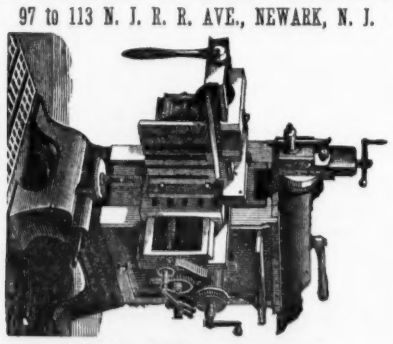

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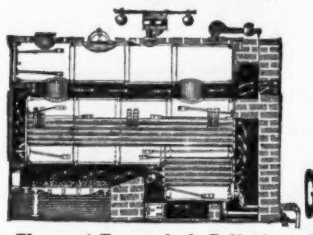

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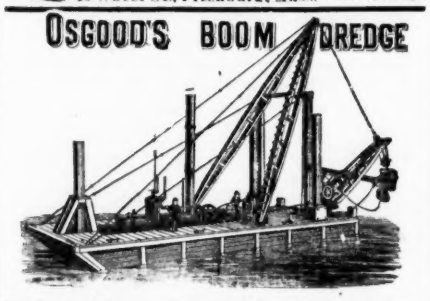

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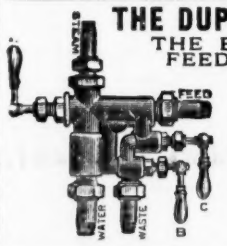

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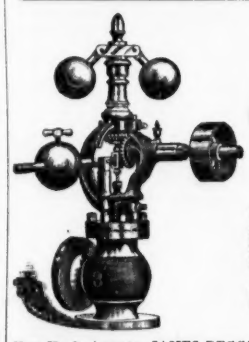

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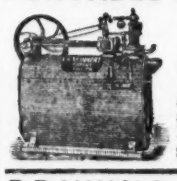

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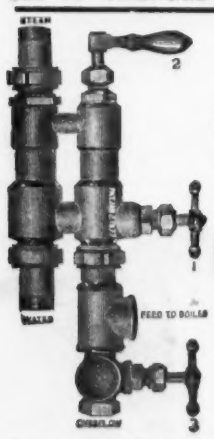

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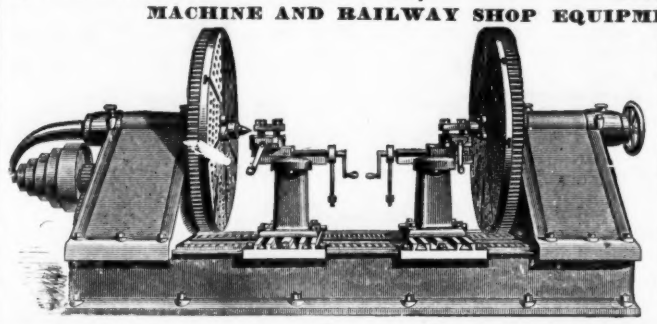

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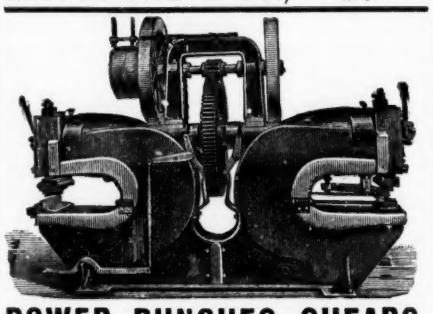

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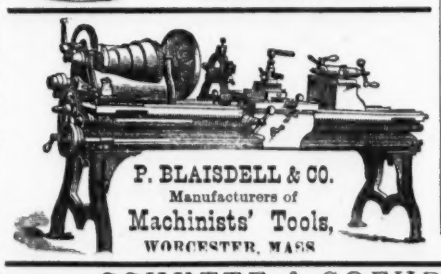

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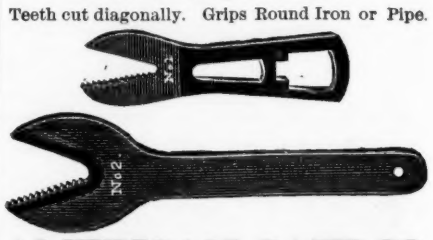

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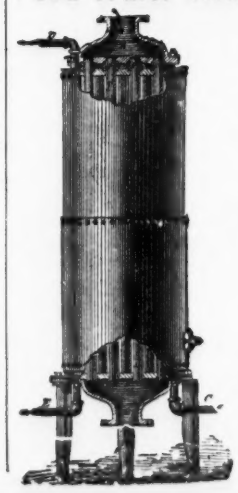

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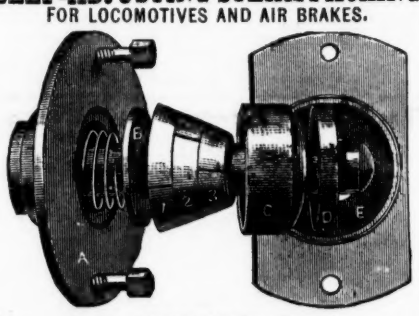

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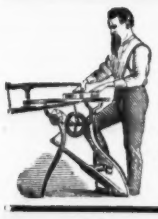

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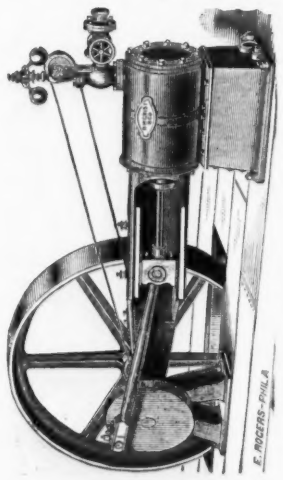

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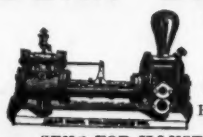

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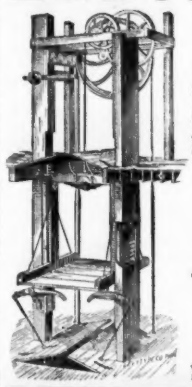

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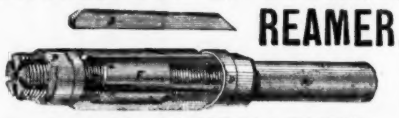

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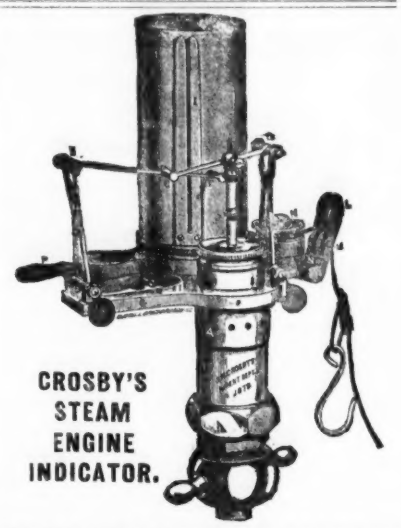

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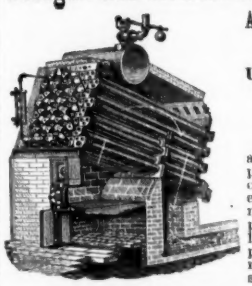

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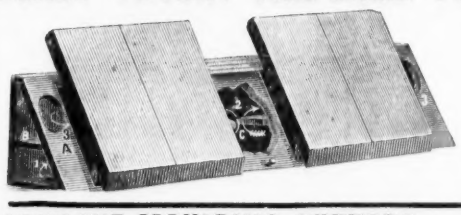

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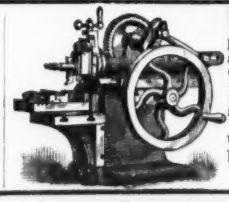

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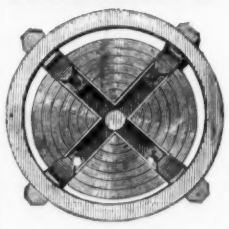

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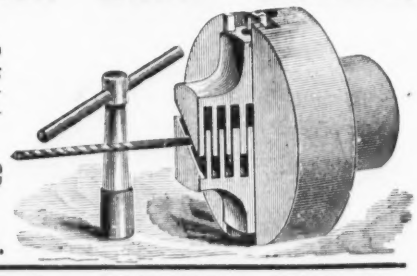

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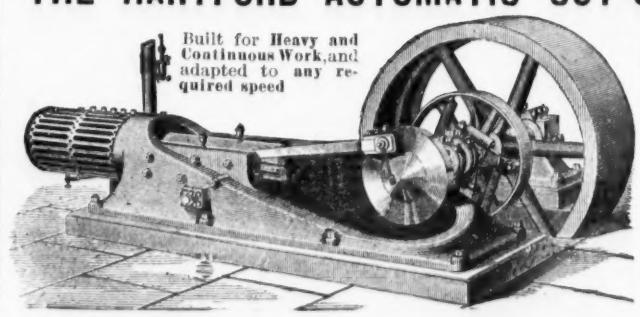

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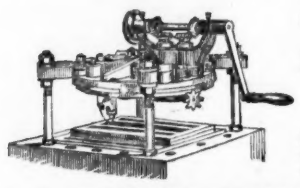

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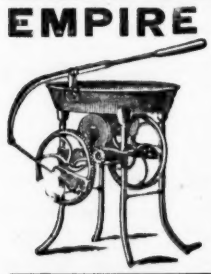

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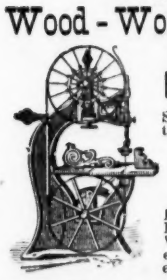

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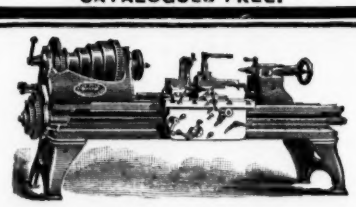

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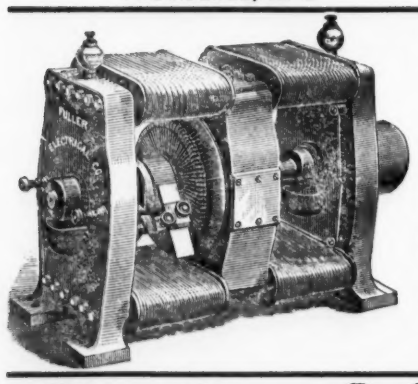

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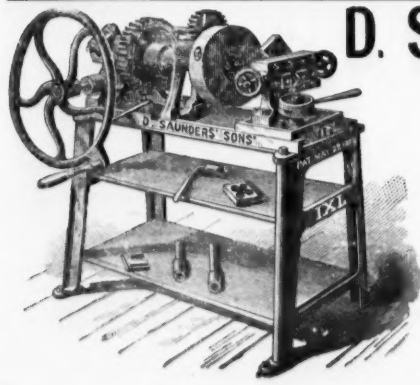

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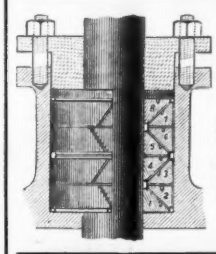

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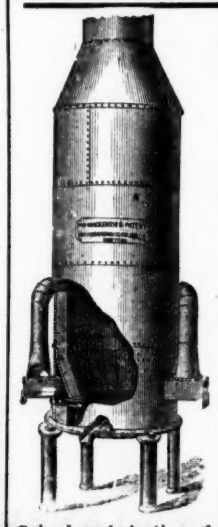

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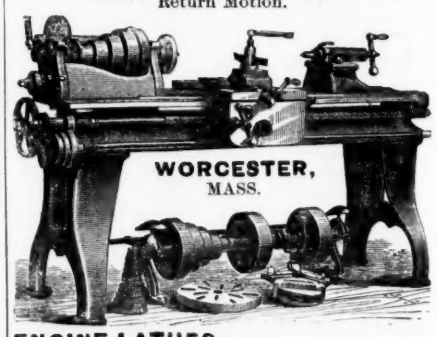

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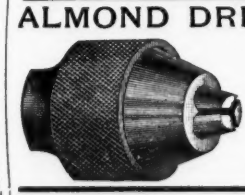

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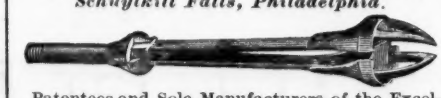

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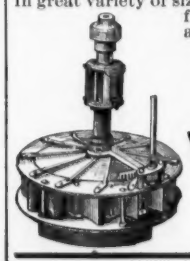

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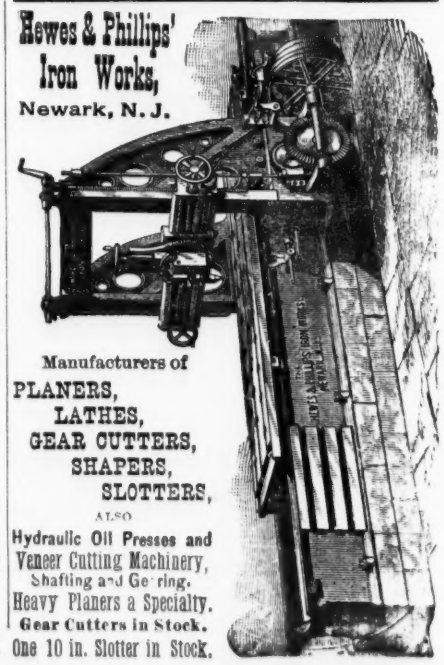

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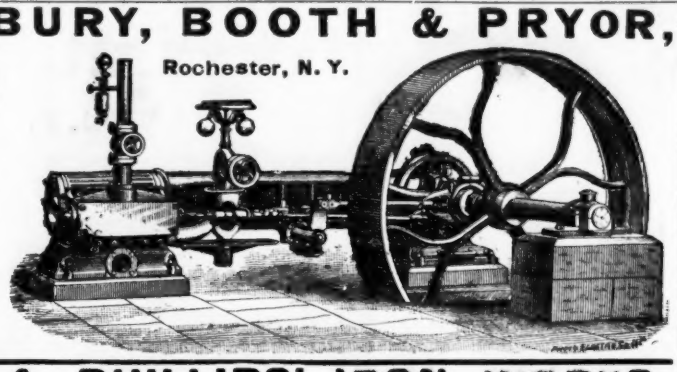

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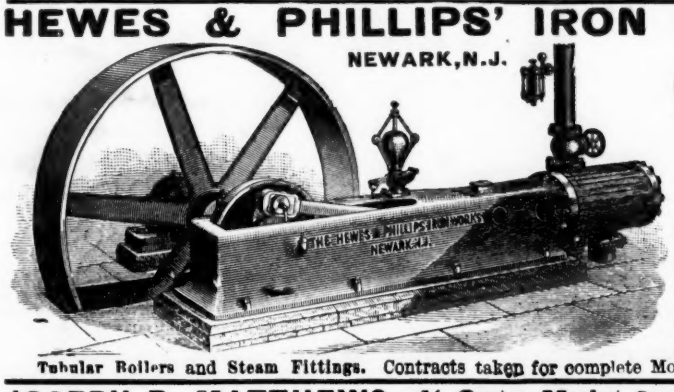

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Two Engine Lathes, 42 in. x 16 ft. Triple Geared. Ames. New. June 1.
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Two " " Each 24 in. 8ft. x 10ft.-12ft.-14 ft. New. Ames.
Three Engine Lathes, 20 in. x 12 ft. Ames. New.
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One " " 15 in. x 6 ft. with Turret. Flathers New.
Two Engine Lathes, 14 in. x 6 ft. Star Tool Co. New.
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Two " " 13 ft. x 5ft. " "
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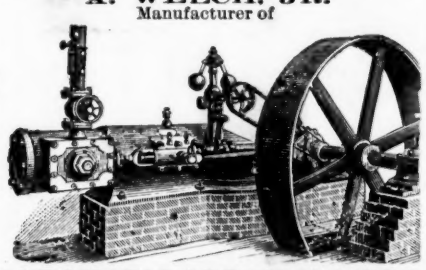

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1 Engine Lathe, 14 in. x 6 ft. Grant & Bogert. New.
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1 " " 14 in. x 6 ft. Star Tool Co. "
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1 " " 16 in. x 7 ft. Ames. "
1 " " 17 in. x 6 ft. Blair. "
1 " " 18 in. x 8 ft. Lodge & Barker. "
1 " " 24 in. x 12 ft. Fifield. "
1 " " 20 in. x 12 ft. " "
1 " " 26 in. x 12 ft. Lathe & Morse. "
1 Plain Engine Lathe, 15 in. x 4 ft. "
1 Engine Lathe, 26 in. x 14 ft. Perkins. "
1 " " 16 in. x 6 ft. " "
1 " " 24 in. x 12 ft. Michel. "
1 " " 12 in. x 5 ft. Prentiss. "
1 " " 12 in. x 4 ft. " "
1 Fox " 15 in. x 5 ft. Pike & Dean. "
1 12 in. x 5 ft. Turret Lathe. Lodge & Barker.
1 Planer, 24 in. x 24 in. x 6 ft. Woodman. "
1 " 16 in. x 16 in. x 3 ft. "
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1 20 in. Upright Drill. Prentiss. New.
1 30 in. " " " "
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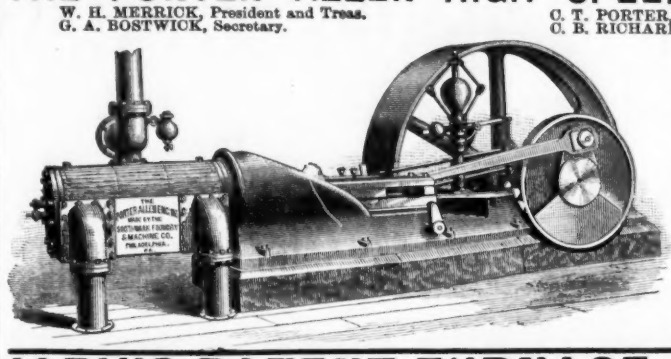

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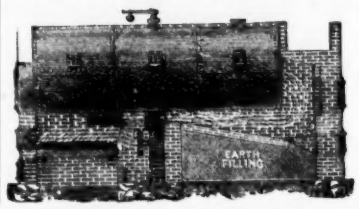

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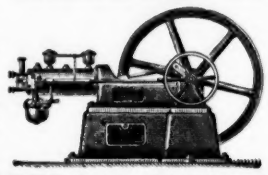

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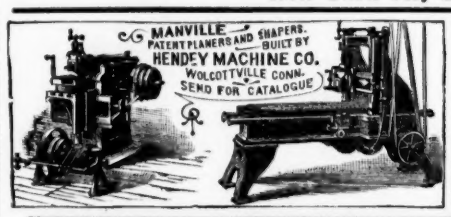

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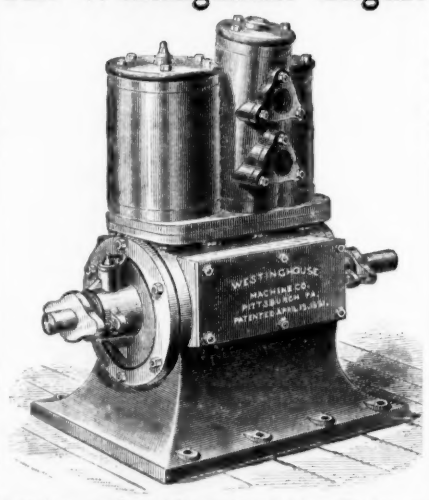

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19 " " 8 " " Gray. (on hand.)
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20 " " 14 " " Fitchburg. "
21 " " 12 " " Blaisdell. "
26 " " 12 " " Powell.
26 " " 16 " " "
36 " " 16 " " Fitchburg. (on hand)
36 " " 18 " " " "

PLANERS.

16 in. x 16 in. x 3½ ft. Parker.
22 in. x 20 in. x 4 ft. Wheeler.
22 in. x 20 in. x 4 ft. Ames.
22 in. x 22 in. x 6 ft. Powell.
24 in. x 24 in. x 6 ft. Ames.
24 in. x 24 in. x 6 ft. Hendey.
27 in. x 27 in. x 7 ft. Ames
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32 in. x 32 in. x 10 ft. Gleason.
38 in. x 36 in. x 10 ft. New Haven.

2 No. 2 Cabinet Turret Brass Lathes on hand.
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1 42 in. " 20 ft. " " " " "
1 36 in. " 12 ft. " " " " "
1 36 in. " 18 ft. " " " " "
2 30 in. swing, 15 ft. bed. Engine Lathes. May.
1 22 in. swing, 13½ ft. Bed Engine Lathes. "
5 22 in. x 12 ft. Engine Lathes. May.
3 19 in. swing, 10 ft. Bed Engine Lathes. May.
2 11 in. " 5 ft. " " "
2 30 in. " Upright Back Geared Drills. "
2 9 in. Shapers. New. May.
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1 18 in. " 11 ft. " " "
1 12 in. " 4 ft. " " New.
2 11 in. " 5 ft. " " "
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2 38 in. Swing Upright Drills. B. G. & S. F. New.
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1 4 " " "
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1 9 in. Shaper. 2d-hand.
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1 Pond's Double Milling Machine. 2d-hand.
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1 No. 2 " Wire Feed. New.
1 Screw Head Slotter. Second-hand.
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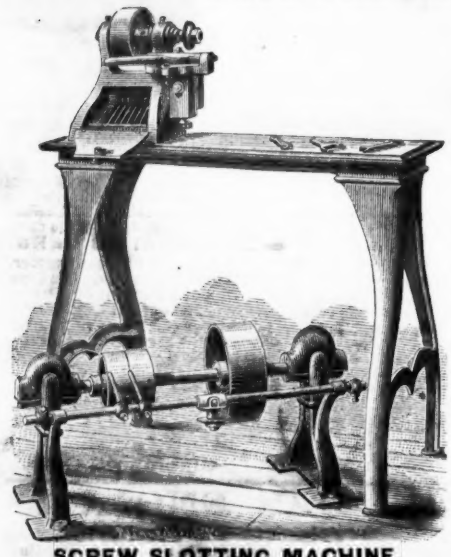

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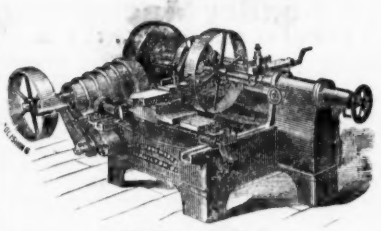
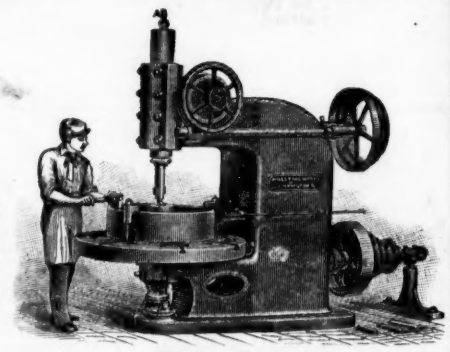


Pulley Lathe.



Pulley Borer.

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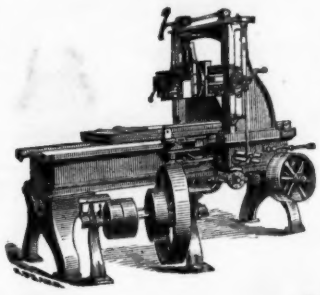

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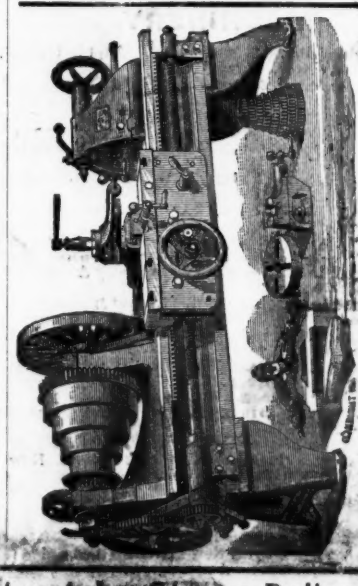

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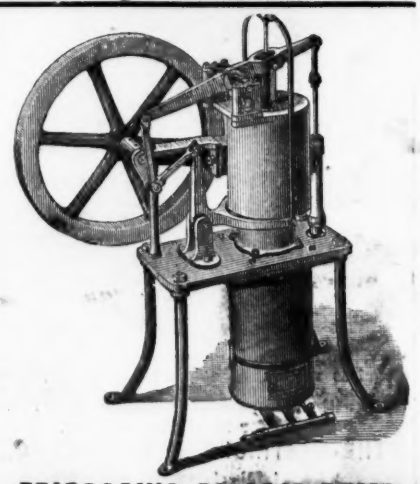

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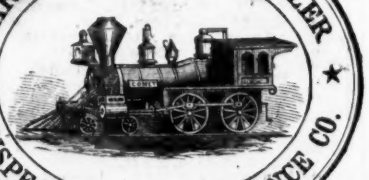

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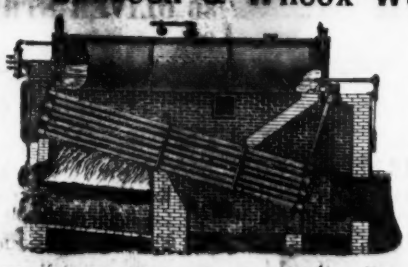

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